THE AUSTRALIAN GEOGRAPHER

Vol. 1
Part 4

August
1932

Hon. Editor: David G. Stead.

CONTENTS.

Page
Great Britain at the Cross Roads—*Macdonald Holmes* 3
The Citrus Industry in the Gosford District, N.S.W.—*A. G. Lowndes* .. 8
Pioneer Settlement: An Attempt at a Synthesis—*John Andrews* 18
Rural Population in New South Wales—*G. Whalen* 35
Brief Outline of Geographical Discovery by Sea, from 1400-1700 A.D.—*F. J. Bayldon* 37
The Geological Basis of Queensland Industry—*W. H. Bryan* 48
China and the Future—*Macdonald Holmes* 57
The Evolution of the City of Manila and its Strategic Significance—*Catherine D. J. Back* 76
Australian Food and Game Fishes—*David G. Stead* 85
Through Persia to Russia—*E. J. Bryce* 93
Book Reviews 99
Annual Report of Society 101
List of Members 104

Journal of The Geographical Society of New South Wales
SCIENCE HOUSE,
GLOUCESTER AND ESSEX STS., SYDNEY.

Price 2/- *(Issued Free to Members)*

Registered at the General Post Office Sydney, for Transmission by Post as a Periodical.

1 8

THE GEOGRAPHICAL SOCIETY
OF NEW SOUTH WALES.

Science House, Cr. Gloucester and Essex Streets, Sydney.

Past Presidents of the Geographical Society of N.S.W.

1927-1928—Professor Griffith Taylor, D.Sc., B.E., B.A.
1928-1929—David G. Stead.
1929-1930—Professor W. R. Browne, D.Sc.
1930-1932—Professor J. Macdonald Holmes, B.Sc., F.R.G.S.

GENERAL COUNCIL FOR 1931-32.

President: Prof. J. Macdonald Holmes, B.Sc., F.R.G.S.

Vice-Presidents: Dr. Charles Anderson, M.A., D.Sc.; Dr. Marie Bentivoglio, Ph.D.; Professor W. R. Browne, D.Sc.; Mr. David G. Stead.

Councillors: Capt. F. J. Bayldon, F.R.G.S.; Rabbi F. L. Cohen; Mr. Frederick Daniell; Mr. D. C. Ferguson; Mr. R. G. W. Gosset; Mr. H. W. Hamilton, B.Sc.; Miss Evelyn Legg, B.Sc.; Mr. H. B. Mathews, B.A.; Comm. M. H. Moyes, B.Sc.; Mr. A. L. Nairn, M.A., F.R.G.S.; Mr. C. V. Potts; Miss E. Slack.

Hon. Treasurer: Mr. M. Frank Albert, F.R.G.S.

Hon. Secretary: Mr. John Andrews, B.A.

Hon. Auditor: Mr. E. Gard Trouton.

Publication Committee: The President, the Hon. Secretary, and the Hon. Editor.

Hon. Editor: Mr. David G. Stead.

NOTICES

The Publication Committee will welcome suitable contributions to **The Australian Geographer** from members of the Society.

The Council of the Society is not to be held responsible for the various views or the conclusions arrived at in the published papers, as the authors are solely responsible.

MEETINGS of the GEOGRAPHICAL SOCIETY OF NEW SOUTH WALES are held, unless otherwise notified, on the Second Tuesday in each month. In addition to the presentation of papers and lectures, members are reminded that Exhibits and Notes of Field Observations are welcomed. Visitors may be brought to the meetings.

Annual Subscription.—Ordinary Members, 10/- (5/- for latter half of year). **Associate Members,** 5/- per annum.

THE SOCIETY'S LIBRARY.

The Society is gradually building up a library of books, periodicals and maps, partly with the aid of generous donations from members. Gifts of this kind are always gratefully received. The Library is at the disposal of members, and is at present housed in the Geographical Department at the University.

THE AUSTRALIAN GEOGRAPHER

Vol. 1. AUGUST, 1932. Part 4.

Great Britain at the Cross Roads *

By MACDONALD HOLMES.

Great Britain has come to a "stock-taking period" in her history. Vast changes in the underlying entities of her life are slowly taking place. Some there be who do not see the true line of advance; others see it, but doubt whether this small island kingdom can take it; but all are "girding their loins together" in the surety that there is going to be an advance. That is the one clear issue, and is the driving power behind the nation. But no nation can advance purely on the intellectual plain with out advancing also on the material side. The converse is not necessarily true.

The phenomenal wealth of Great Britain was accumulated in the last one hundred years or so, and it is pertinent in a lecture such as this to enquire just how the production of such wealth was possible, and what was the general effect upon the whole world as this small nation became great. Great Britain is small in area, but the length of the coast line, the number of estuaries, the opportunities for sea and land contact estimated per head of the population and per unit of area is greater than that of many other nations. Thus the purifying effect of the oceanic atmosphere, the abundance and even monthly distribution of cleansing and fertilising seaborn rain, the utility of the oceanic waters and the abundance of their food supplies are no small factors in the persistent vitality of the nation.

In these far northern islands the raw products of industry, namely, coal and iron, without which no industrialisation could have taken place, are abundant; and these, combined with an inventive genius from the first discovery of the steam engine, gave Britain an early start in world affairs. Unfettered commerce founded on the use and export of coal meant that every quarter of the globe contributed to the wealth of Britain. It was her proud boast that her finance went out to produce wheat on the farms of Canada and Australia, that the sheep farms of the dominions contributed their wool and South America its cattle, that the tea and spices of the East supplied the British market, and that the Mediterranean was her fruit garden.

---

* Presidential address to Society, given on July 14, 1931, and illustrated by lantern slides, showing changing production of Great Britain.

Everywhere British civilisation has stood for free institutions, liberal thought, a free press and the generosity and power of her financial institutions. The British Empire has seven members in the League of Nations, and has an area estimated at 13 million square miles, or one-fourth of the land surface of the globe. This empire, too, is now responsible for one-fourth of the world's food supply, and its economic resources are the greatest under any one political system.

Great Britain's position was in the past largely that of the workshop of the world and the carrier of its trade. Though very nationalistic, her frontiers were and are international. This international connection involved a maximum development of her industries. It meant a free flow into Britain of raw products from all over the world. It meant an absolute freedom of trade in raw products, but it was not that kind of free trade which has existed latterly as a flow of manufactured articles into Britain.

The people of Britain had to learn to live largely on imported food, and in comparison with manufacturing, agriculture, though progressing remarkably, was inadequate and was of much less importance. In Britain to-day there is a bigger variety of cheap and good food, mostly of foreign origin, than in any other country in the world. Her colonies, many of them now self-governing dominions, were to supply raw products and to take back manufactured articles. As well as the export of cotton goods, cotton machinery was exported. As well as ships being built for all parts of the world, ship-building machinery, and the men who built the ships, were exported to distant lands. It was possible for this small island kingdom to accumulate a dense, highly organised and skilled population because of the profits earned by the exporting industries. Britain's greatness depends upon cheaper and greater quantities of fuel and power than her neighbours; upon her ability to produce cheaper articles and an equal ability to find markets for them, and to be able to do these things better than all her competitors. World supremacy then involved free trade, freedom of the seas, empire trade expansion, world isolation, and centralised world industry. This supremacy is now challenged. The world is decentralised, and Germany, Italy, the United States and Australia are themselves collecting regions for raw products, and are now making their own manufactures. The whole world policy between nations has changed, so that self-sufficiency and nationalism are the essential characteristics.

Command of the seas is questioned by other powers, notably the United States of America, who claim the need of a fleet equal in size to that of Great Britain. A further challenge comes from the fact that economic exploitation of the world was disorganised after the war, and at that time Britain, being the greatest trader, suffered more than any other country in this respect. Abrupt cessation of trade is as great a war tragedy as, say, the spoliation of France by the war, and is of much greater world significance. Each country now hopes to convert its own raw products, and even export them in a manufactured form; as is suggested, for example, in Australia. Some nations also have been used to low standards of living, and have cheap labour. How far can Britain accept this challenge and maintain the same value and volume of her industrial products irrespective of whether she is supreme or not? Although Britain is an island kingdom off the coast of Europe, she has never been one of the European powers. She has always been individualistic. From time to time she has entered into alliances with European powers, but always left herself free to act in a world capacity.

With the rise of the great maritime trade to the East, Britain was then an outpost of Europe. Again, with the discovery of the new world and the growth of the United States and the great world expansion of trade, Britain was still an outpost of Europe. In fact, she became the great "middle man" between the known countries of the world and the markets of Europe. In modern times she is one of the three world groups almost equal in power in a commercial sense, namely, the United States of America in the west, Britain in the centre and the European nations on the east. It is thought by many that the balance of commercial power is between the United States and Europe, and that to maintain the balance Great Britain must ally herself more closely with Europe. That was the idea which may have suggested itself when Monsieur Briand moved for a United States of Europe. A brief survey of tendencies will show that Great Britain must remain a non-European power and preserve her world outlook. Certain forces tend towards a closer alliance between Great Britain and Europe. For example, there is a closer connection between British and continental culture and history than between the culture of the United States of America and that of Great Britain, despite the common bond of speech. The Anglo-Saxon heritage of past history in Britain is claimed as closer bond with Europe than the heritages of the many nations comprising U.S.A.

Great Britain, because of her geographic position, is still an entrepot for much of European trade, and the inertia of her past greatness tends to maintain that function in spite of the direct shipping lines to all European sea ports. Great Britain is much concerned with peace in Europe. The concern of Britain, however, is not so much her interests in Europe as the effect which repercussions in Europe have upon British world interests. For that reason, therefore, Great Britain plays a foremost part in League of Nations affairs, and in such pacts as that of Locarno.

Financial issues unite Europe and Britain very closely. Some see the United States as the first financial nation in the world, and therefore it might be necessary for Great Britain and Europe to form a block in competition with the United States.

In recent times it is quite clear that Great Britain is still the premier financial nation of the world, and has no need to merge its identity either in the New World or in Europe. The forces tending to prevent Great Britain forming close alliance with Europe are due to the power and geographic distribution of her empire. The British dominions refuse to be drawn into European facts. Then again it is to the interest of the European countries to have England as a world centre at their door rather than the world centre of gravity across the ocean in the New World. It is worth while from the point of view of self interest of the European powers to assist to maintain in many fields of activity the world supremacy of Great Britain.

Then again there is a tendency to close alliance between Great Britain and the United States because of common speech, and in particular because of the number of British immigrants who have entered the United States. Then there is the question of the freedom of the seas. The policing of the seas formerly undertaken by the British navy to safeguard world trade is now too big a job for any one nation. The International Ice Patrol off North Eastern America is a splendid example of joint action. A further enlargement of Great Britain's horizons compared with the more parochial outlook of the European States comes from the dominions and colonies of the British Empire. The dominions are not likely to agree to a submergence of Britain's identity in European affairs. It must be clear, however, that direct trade between the various parts of the empire rather than through Great Britain must influence the latter to seek alliances with other nations, e.g., the Argentine.* The self-sufficiency of the dominions also in regard to manufactured articles makes Britain concern herself more with the Crown colonies and with the search for new markets. There are many factors favouring the persistence and maintenance of British world supremacy. Liaison with the United States would place her in an inferior position; a liaison with Europe would hinder the development of the Empire, and though the issues in Europe require delicate handling, Britain must be in Europe but not of it. The great problem concerning the dominions is whether we can afford to be industrially self-sufficient and only send our surplus food products to Great Britain. It is quite clear that reciprocal trade, i.e., Empire trade, alone may suit parts of the Empire, but cannot satisfy the needs of Great Britain. Of course, a new point of view may arise in which not Great Britain alone would hold the balance in world affairs, but that all parts of the Empire would more closely unite and consider themselves as a single entity; operating in competition against the rest of the world. The progress of world exploration and economic exploitation is such that the lands in temperate regions are now self-sufficient units, and do not offer much trade the one with the other. On the other hand, the tropical regions and the Far East are entering on a sphere of modernisation, both as regards food production and industrial activity. The trend of trade which was formerly East nad West bids fair now to be North and South, and will take on a character of geographic compulsion in that North and South will be producing things which each other cannot produce. Great Britain, in virtue of the fact that many of the Crown colonies are in tropical regions, is therefore making an early start in what is the future of world development.

---

* Note recent desire of Argentine to be represented at Ottawa Conference.

It has been claimed by some that the internal conditions within Great Britain are no longer suited to her role of premier nation in the world. The coal and iron industries, the basis of her supremacy, are showing diminishing returns, and while they no longer are solely relied upon by the nation, nevertheless they have been reorganised and are meeting the strain of modern conditions. Hydro-electric power and oil, two modern assets of world power, are being made use of in sufficient quantities in Great Britain. A recent national net work of electric schemes partly using water and partly the various forms of coal has just been completed. The heavy industries and the textile industry are being reorganised.

Britain's industrial policy always experiences a series of reorganisations. She is often first in the field with invention and the commercial exploitation of some commodity, and when she has taught the world how to do it as well as she herself does it, or when her rivals press her too hard, reorientation takes place and advancement proceeds, e.g., in the change from steel plates to ship building, in the change from the building of ships' hulls to equipping them with modern machinery, in the change from cotton cloths to various high-grade cotton articles. At present there is a change in the centre of gravity of industry in England, and this coincides with a change in internal policy. The heavy industries and the coal fields have no longer the monopoly, and industry in general is being more widely distributed. New manufacturing industries, such as the motor industry and wireless parts and food products, have sprung up south of the coal fields. Ford chose London for his greatest factory outside U.S.A. to supply the East, Asia and Africa.

In recent times the flourishing condition of these industries has been instrumental in minimising the depression in the heavy industries. The keenness of foreign competition, however, has meant that with this change has come the cry for the change from free trade to a tariff policy. The full significance of this change and its effect upon British agriculture and upon the dominions is about to come into prominence.

Thus, at the present time, both as regards her internal and external affairs, Great Britain is standing at the crossroads. Her friends and her enemies, not forgetting her family, the dominions, are adjusting themselves to new circumstances, per-

4

haps to new alliances. Great Britain is awake to the issue at stake and is "making good." For example, Great Britain's aggregate production in the last period increased faster than the growth of population, also there was an increased output per man employed in the new industries. Up to 1930 Great Britain had recovered to the extent of 80 per cent., whereas the United States had only made a recovery of 70 per cent.

Although the dominions will take an increasing part in Empire affairs and contribute materially to the welfare of Great Britain, just as Great Britain has and does to the dominions, and although that is for immediate discussion, world-wide commercial connections and the avoidance of too restricted local alliances, either with Europe or the dominions, form the necessary policy for the maintenance of Britain's competitive position and the guarantee of her future prosperity.

The Citrus Industry in the Gosford District, N.S.W.

By A. G. LOWNDES, B.Sc.

The traveller passing through the Gosford region either from the north or south will receive a surprise on entering the orcharding country. If coming from the south, the road from Hornsby has led over sandstone country, with rocky surfaces and deep valleys, until the Hawkesbury is reached, when the broad estuary is crossed and the road climbs up on to the timbered Peat's Ridge. Then the road descends on to Brisbane Water and Gosford, and goes up Narara Creek valley, and within a mile one passes from the sandstone's rocky unproductiveness to a highly productive orchard land. Similarly, coming from the north via the new northern road. The road skirts Lake Macquarie, passes over unproductive land around Morisset, until Wyong is passed. Here we go along a flat sandy stretch, cross over a hill, and suddenly see the wooded hills of the orchard country opening out before us. This orchard country has an individuality and charm of its own, and one feels that here man's occupation of the soil has not detracted from the beauty of the scene. The slopes of the hills are clearly defined by the ordered rows of trees, and there is a pleasing contrast between alternate sides of the spurs, with orchards on one side and gums on the undeveloped side; as one traverses the roads around Matchem and Terrigal, the bright areas of orchard, with their living dark-green colour set og by golden spots, stand out pleasingly against the eucalypt bush, which itself is brighter in colour and thicker on the richer soils and sheltered positions offered by the valleys. In the creeks through the higher land to the west, too, orchards play an important part. Again on the sandstone plateau of Mangrove Mountain, the traveller is surprised to find large orchards in selected positions, where man is forcing a harvest from nature on seemingly barren land. The citrus industry is probably the most interesting thing which the region offers from the standpoint of a geographical study.

In the production of oranges the United States and Spain lead the world, California producing the greater part of the United States' crop. Australia ranks about fifth, after Italy and Japan. In Australia, New South Wales produces some two-thirds of the total.

In New South Wales, the adjoining counties of Cumberland and Northumberland produce 60 per cent. of the crop, and, until recent years, the only other big producing area was in Colo Shire. Now the increased production on the Murrumbidgee Irrigation Area and the smaller areas on the Murray are also playing a part in swelling the production, which has increased from 487,000 bushels in 1897 to 3,031,000 bushels for the year 1928-29. Erina Shire includes all the orange-producing areas of Gosford and the surrounding districts except Dora Creek and Martinsville, and the position of Erina Shire on the chart gives a fairly accurate idea of the growth of the industry in the Gosford district. In 1897 the district produced only 3 per cent. of the State's citrus crop. However, orchardists from County Cumberland soon began to appreciate the excellent sites waiting to be developed, and the production of the district steadily increased in importance until, in 1923, 21.2 per cent. of the total was produced in Erina Shire, and in 1928-29 34 per cent. of the total was grown here. In the latter five years as much progress was made as in the preceding fourteen years. In 1928-29, over a million bushels of citrus fruit were produced in this area.

We thus see that the orcharding region in Erina Shire supplies over one-third of the citrus fruit production of New South Wales. Gosford oranges have a very high reputation for flavour and texture. The size of the fruit depends largely on the amount of water which the trees receive, and partly on this account the Irrigation Area fruit has an excellent appearance. Nevertheless, the orchardists of the Gosford district assert that their fruit is better in quality.

Geographic Factors in Production.

Here may be considered briefly the main reasons for the growth of the industry to such dimensions here. In the first place the climate is very satisfactory, and irrigation is not necessary in the dry months. The district has an annual rainfall of approximately 50 inches, with the maximum precipitation of 540 points in the growing season, and an average fall of 280 points in the driest month, October. Careful cultivation methods are used to conserve this moisture, and the non-dependence on irrigation allows well-drained slopes to be utilised which produce healthy trees less liable to the serious diseases which attack orange trees on badly drained sites. The temperature regime is that of a mild climate comparable with the Mediterranean, and is thus well suited to the ripening of citrus fruits. The damage done by frosts is not serious, and in most cases the choice of suitable sites lessens still further the risk of frosts. Even on frosty flats it is often only necessary to pay special attention to the youngest trees. The liability of a site to severe frosts cannot usually be predicted except in obvious cases, as near the sea where frosts do not occur, or in the bottom of valleys away from the sea where frosts generally occur. In other cases the local conditions often product frost-free slopes, where frosts might be expected and vice versa. The most general statements that can be made are that higher slopes are less liable to frost, and that aspect may play a part, although there is no general agreement about the best aspect; a southerly aspect is usually the worst.

The other principal natural factor is the presence of good soils and a topography well suited to the planting of orchards. The Triassic and Permian rocks which occur here dip towards the south, and the Narrabeen shales which underlie the Hawkesbury sandstone come to the surface a little south of Kincumber. Proceeding north, the capping of sandstone becomes thinner, and the rugged, rocky hills give way to rounded slopes with a good soil covering and a natural heavy vegetation. Even where the hills are sandstone capped, the lower slopes offer good orchard sites, and these slopes are usually not so steep as to prevent cultivation. This latter factor is most important, because, although farmers will develop orchards on apparently impossible slopes, the difficulties of cultivation, pruning and picking are increased on steep slopes, and the damage done by storm water in removing humus and topsoil is more difficult to combat.

A most important advantage which this district has is its proximity to Sydney and Newcastle, which are both about 50 miles away. There is connection to these markets by both the main northern railway and the excellent new Sydney-Newcastle road. These routes pass through the centre of the main producing region, and I estimate that 55 per cent. of the orchards are within three miles of the railway (and main road), and only 24 per cent. of them further than eight miles. The position is not so much that distance from these routes defines the limits of settlement as that the potentially productive areas chanced to have this grouping about the best route which the topography offered for the construction of the road and railway.

Before the opening of the northern railway and the Hawkesbury River bridge in 1889, the only land connection with Sydney was by the difficult and circuitous route across Pennant Hills to Wiseman's Ferry, Windsor and thence to Sydney. Old settlers recall the times when fruit and vegetables were carted to the head of Erina Creek and taken by launch to Woy Woy, where they were again transhipped to small steamers, which went via Brisbane Water to Broken Bay and thence to Port Jackson. It was not until modern communications eliminated so much costly handling that the district could tbe fully developed. At the present time there is some competition between the railways and motor transport. The latter has captured much of the cartage, especially of the more valuable produce or of things which require or suffer from much handling—for example, early vegetables. The reason is that motor lorries take the produce direct from the farm to the market, whereas two extra handlings are involved in railway transport, first from the cart to the train, and then from the train to the Fruit Markets at Sydney or Newcastle.

Summarising, the main reasons for the growth of orcharding in Erina Shire are:—

(a) Suitable climate.
(b) The good citrus soils derived from the tuffaceous Narrabeen shales, and occurring in the river valleys.
(c) The flat-floored valleys.
(d) Good communications and proximity to principal markets.

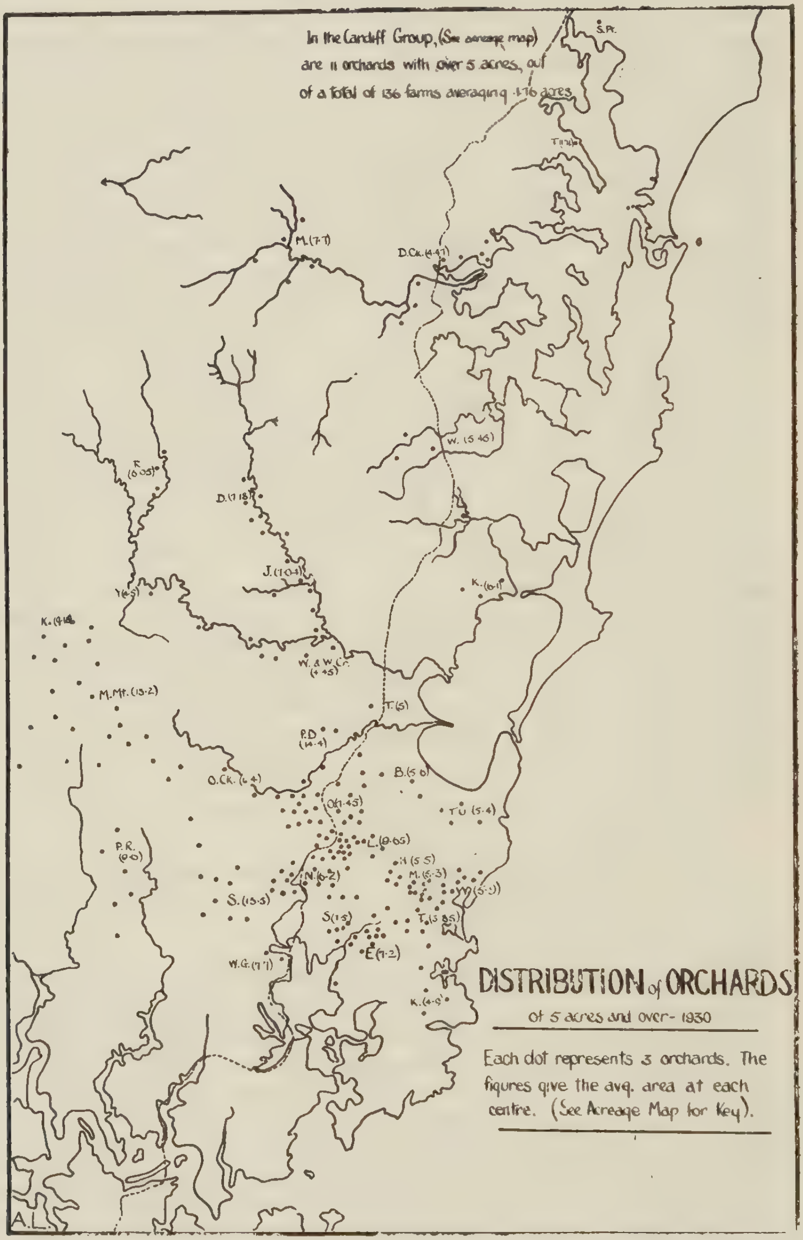
Distribution of Orchards.

In 1930 there were 7,833 acres of orchards in the coastal district between Broken Bay and the Hunter Valley. The two maps showing distribution and acreage show in detail the localisation of the industry. In this district there are four distinct types of country on which orchards have been developed, viz.:—

(a) The Narrabeen shale hills.
(b) The Hawkesbury sandstone plateau.
(c) The flat-floored valleys.
(d) On the outcropping coal measures and lower beds of the Narrabeen series.

(a) The Hills in the Narrabeen Shale.

In this division occurs the greatest acreage of orchards. It stretches from Tuggerah railway station in the north to the southern boundary of the orcharding zone, and from the Pacific to the dissected edge of the sandstone plateau. From the distribution map it will be seen that the orchards are not evenly scattered over the area, but concentrated in spots, and there are none over a considerable part. The blank spaces in the orchard map correspond to the rugged sandstone-capped outliers of the plateau. The areas under orchard correspond approximately to the main river valleys and the headwater streams, and to the lower slopes of the residual hills. Narara Creek and Ourimbah Creek, both running north and south, have cut back, giving the single valley from Gosford to Tuggerah utilised by the railway. On the slopes of this valley and its arms occur the important centres of Lisarow, Narara and Ourimbah, which have the greatest concentration of orchards. As elsewhere in the district, the soils on these slopes vary from spur to spur, adjacent slopes often showing important differences in soil depth and character of subsoil, but in parts every slope with suitable aspect is under


In the Cardiff Group, (See acreage map) are 11 orchards with over 5 acres, out of a total of 136 farms averaging 4.76 acres.

DISTRIBUTION of ORCHARDS of 5 acres and over - 1930

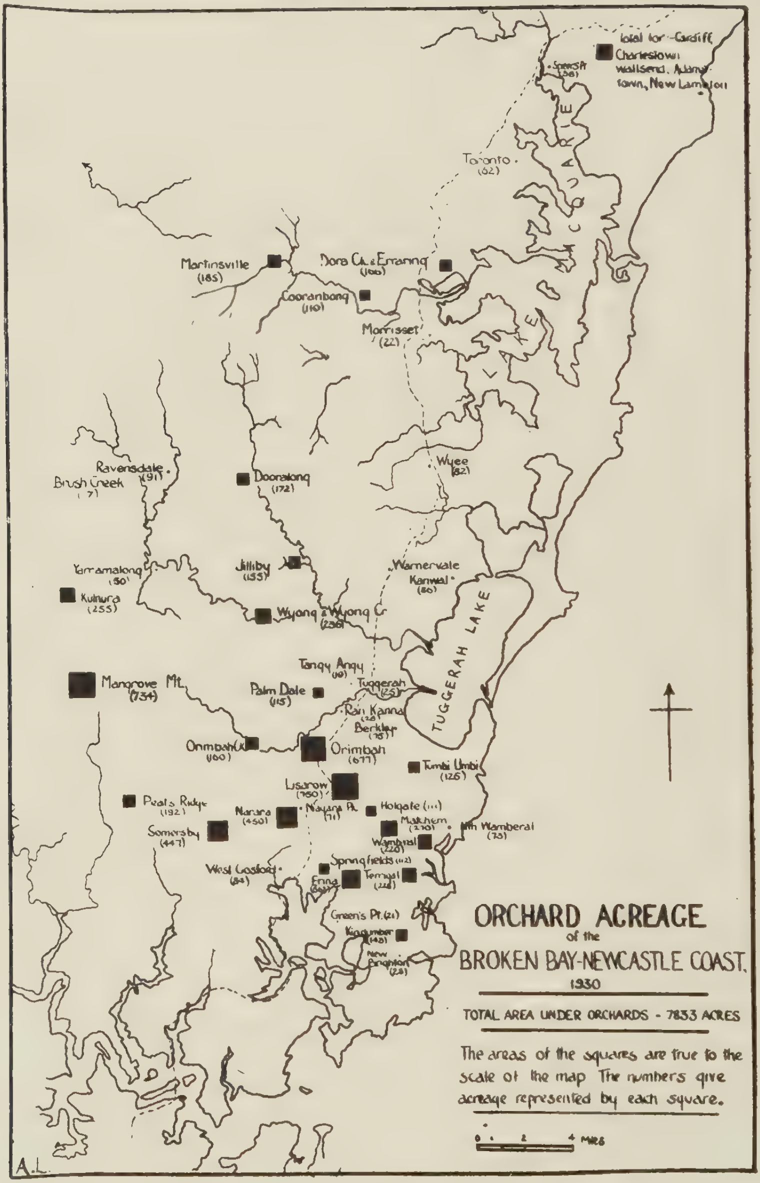
Each dot represents 3 orchards. The figures give the avg. area at each centre. (See Acreage Map for Key).

orchards The floor of this valley is fairly wide, but is generally unsuited for orchards and cultivated for fodder crops for the dairies which occur here. This valley has an advantage in its proximity to the railway. Most of the other orchards in the shale area occur on the slopes of the valleys cut out by Erina Creek and its tributaries, and a good depth of soil is generally obtained. Citrus trees do not begin to bear profitable crops until the fourth or fifth year; and, as will be seen later, different "catch-crops" are grown in different parts to tide the farmer over this period. In the shale area it is possible to get sheltered locations with good sunny aspect on the tops of hills, which show a general freedom from frosts, and many farmers are able to specialise in early vegetables, which are ready for the Sydney market before the Hawkesbury River vegetables begin to arrive, and they thus get highest prices. The soil seems very well suited for vegetable-growing, and in most cases a crop of cabbages, beans or some such vegetable is grown between the rows of young trees. Where the valley floors are sufficiently flat the farmer may also supplement his income by a little dairying.

The average area of orchard owned by each farmer, as given by the figures on the distribution map, are interesting in this respect. It is generally considered that about eight acres of citrus orchard will give a man his living, and this is also about as much as one farmer can satisfactorily attend. So that where the average acreage at a centre is about eight acres, orcharding is the main occupation; where the acreage is much less than eight acres a subsidiary crop may be anticipated, and where the acreage under orchard is less than about four acres orcharding is the minor occupation of the centre. In the shale area it is seen that Lisarow (9.65), Ourimbah (7.45), Springfields (7.5), Erina (7.2) and Narara (6.2) have the biggest average acreage, and the figures show that orcharding is the principal occupation, with very little reliance on other activities. On the other hand, Tuggerah (5.85), Wamberal (5.9) and Matchem (5.3) show dependence on another crop, and this is vegetables. The reason is partly that the first group has been longer developed and the number of young orchards is few. Vegetables, although taking more attention, give a bigger turnover than fruit, and with the extra haulage costs to the railway the farmers of the last group find it profitable to devote some time to vegetables. There appears to be a tendency for farmers away from the railway to cultivate market gardens because of the prevailing low prices for fruit.

(b) The Hawkesbury Sandstone Plateau.

An interesting and quite unexpected experience is to travel along the Hawkesbury sandstone plateau at 1,000 feet elevation and through the uninviting scenery (agriculturally speaking) which is generally associated in one's mind with its rocky undeveloped surfaces, and come upon a citrus orchard of 65 acres, the biggest in Erina Shire, with healthy trees yielding good crops. In the topographic region marked as Hawkesbury Sandstone Plateau there are 1,628 acres cultivated as citrus orchards, i.e., 20 per cent. of the area on this part of the coast. The reason for this is that here the sandstone is not as deeply dissected, and in certain spots the soil has not been washed away, so that it occurs in depths not usually encountered. Orchardists in this district also maintain that the sandy soil has advantages over the richer soils of the shales which are not apparent at



first. The soil in the orchards usually has a minimum depth of about three feet, with a gravel subsoil, and this gives well-drained conditions—a great advantage in citrus culture. In drought, too, it is maintained that the sandy soil retains its moisture well if cultivated, and it does not show the tendency to powder which heavier soils show after much cultivation. In the Mangrove Mountain district the soil is regarded as merely a medium for feeding manures to the trees. While manuring has to be very heavy to obtain good results, there is the advantage that a fruit of finer texture is obtained than often develops on richer soils.

The best orchardists on the sandstone country are able to keep their trees bearing heavily even after twenty years, but most farmers find that on rich soils with a clayey subsoil, trees tend to make vigorous growth, and eleven years is regarded as the prime of a tree. On the lighter sandy soils of Mangrove Mountain trees on the whole have a longer life, and trees may be seen yielding fourteen bushel cases per tree and still in their prime at 22 years. In this district, too, there is a certain freedom from fruit-flies, and spraying need only be performed once a year. However, the orchards are usually more exposed than in the sheltered deep valleys of Lisarow and Matchem. Maximum use is made of natural vegetation as windbreaks. The main wind to be feared is the westerly, which is cold in winter and dry in summer, and a north-easterly aspect is preferred. The distance from the railway is also a handicap, as the cost of fertiliser is increased by so much as 22/6 per ton to cover freight, and the freight to the railway at Gosford is from 3d. to 9d. per case of fruit, according to the distance from the railway. At times when fruit is only bringing 3/6 per case this is a serious consideration. The feature of the "mountain" fruit which makes this possible is that this is a "late" district. The oranges blossom in September in the area nearer the coast, and the main crop is obtained in May and June, but the late Valencias blossom later, and can be held back on the trees until as late as March, when peak prices are obtained after the supply of navels and Joppas has fallen off.

In the economic regime of this district, passion fruit replaces vegetables as the "catch crop." Vegetables cannot be grown because the ground is not sufficiently fertile, and the crops could not be obtained until the market was being well supplied from other sources. Any good light friable soils are suitable for the passion vine, and it is well suited in the deep sandy soils here. The passion vine bears and pays well after eighteen months, and its productive life is five or six years, so that the oranges are beginning to bring returns by the time that the passion fruit has passed its prime. Everywhere in this district passion fruit is seen on the orchards which are still being opened up. The method is to grow the vines along wire trellises between fencing-posts. The rows of vines are placed midway between the rows of young orange trees at distances of about 12 feet between the vines, this giving about 200 vines to the acre. The summer crop is harvested from late January to March. This is the main crop, and the prices received are lower than for the winter crop. Last season (1930) the price ranged from 28/- per case down to 10/- or even less. A bushel case contains about 35 dozen fruit. Fruits ripening late in the season realise much higher prices than those ripening earlier, and sell sometimes up to 30/- per case, and here again Mangrove Mountain, being a late district, profits. A case to the vine is considered a fair average. The nature of the soil makes post-sinking easy, and there is not the tendency for the vines to go to bush at the expense of the fruit as is found on rich soils.

It is seen that the average acreage of orchards is high; Mangrove Mountain (13.2), Somersby (13.5), Kulnura (9.18) and Peat's Ridge (9.6). This is because orcharding is the only occupation, and there is very little other activity by the farmers, although in select positions the growing of late vegetables, and especially late tomatoes, is made profitable by the high prices obtainable. This district probably offers the greatest scope for further development, as there are still some sites as good as those occupied at present, whose only drawback is that they are a little removed from the main roads.

(c) The Flat-Floored Valleys.

Penetrating the rugged sandstone mass are three main creeks—Dora Creek, with its three headwater streams; Wyong Creek, with its tributaries Jilliby and Brush Creeks; and Ourimbah Creek. In each of these creeks there is only a small thickness of shale on the lower slopes of the valleys, and as a rule sandstone benches prevent the orchards being extended far up the hillsides. It is noteworthy that as these streams all flow east and west, there is a sunny and shady side, and in very few cases is the northern side of the valley cultivated; and in the north and south aligned portions of the streams' spurs with a north-eastern aspect are usually selected. In parts the rich creek flats have also been planted with citrus fruit trees in the fertile soil which once carried dense brush. Trees planted here are subject to heavy frosts, but damage is only done to young trees as a rule. Again, big floods which sweep the lower flats may be expected annually, and these damage the orchards in many ways. At Martinsville on Dora Creek were seen trees with all the roots exposed necessitating considerable labour in resoiling. This damage is made more likely if the ground has been freshly ploughed, and for this reason cultivation is suspended until the danger of winter floods is thought to be past. But even greater damage may be done by floods in carrying logs and rubbish which break the roots, causing trees to die back. The silt brought by the streams is not very considerable, but leaves and other vegetable material dropped around the trees are of some value. Orcharding in these creeks has no special advantage over other districts, except in the richer soils as at Martinsville; consequently there is nothing to offset the increased transport costs from points far up the stream, and this has an influence in limiting the extension of the orchards. Thus the spectacle was seen at Dooralong and Yarramalong of farmers pulling out bearing orange trees with bullock teams so as to use the land for dairying, their contention being that they will get some return for milk and cream, but the orchards are definitely not paying here. There are many who maintain that the industry is not in such a condition as to justify this, and that such failure is due to poor methods; but the denial of an economic law in pushing development beyond the limits where that development will be able to compete with other enterprises more favourably situated as regards transport has played its role in creating this position.

In the case of the "creek" orchards, the average acreage figures again indicate the nature of the economic regime. In no case does the acreage indicate total dependence by farmers on orchards, except at Martinsville (7.7), where the flats seem very well suited for orchards. The smallest orchard acreage per farmer is found on Wyong Creek, where there is a good deal of dairying carried on because the flats here are wider than on the other creeks. The influence is not that a farmer would prefer dairying to orcharding if he had the option. It might be inferred that the grading off in the importance of orcharding towards the north is in part due to the increasing suitability for dairying and relations with the Hunter River Valley. The region under discussion is distinctly separated from the Hunter by physiographic barriers, and the distribution of orchards depends on the areas of most suitable conditions. Whether a site is used for orcharding or dairying is in most cases entirely determined by which it is most suited for.

(d) On the Coal Measures and Lower Beds of the Narrabeen Series.

In general the soils on the rocks of this series are shallow and stony, but at a few selected places there is sufficient soil depth to make orcharding possible, but even the best spots are not really good for orcharding. At Dora Creek the soil in the orchards is usually not deeper than 2ft. with a clayey subsoil. As a result, the soil is fairly wet and after rain the ground fills, excluding air; and such waterlogged conditions are unsuitable for citrus orchards. In places the difficulty has been overcome by putting a line of agricultural drainage pipes between every row of trees, so that each tree is not more that ten feet from a drain; but in spite of this the orchards are not really first class, and will probably have a short bearing life. At Dora Creek the average size of the orchards is 4.47 acres, and this is because vegetables are grown a lot. All the land which was sufficiently good to be taken up in farms lies along the edge of Lake Macquarie, and thus freedom from frosts makes the growing of early vegetables possible. The type of country is more suited for market-gardening than orchards, the only drawback being that owing to the freedom from frosts, fly-pests are present all through the year. Dora Creek is on the main railway line, and this is a considerable advantage, for other similar land is found elsewhere on the shores of Lake Macquarie, as at Fennel's Bay and Rathmines, but these have not been developed because of transport difficulties, and it is also hoped that residential and tourist resorts will be opened at these points.

North of Dora Creek towards the Hunter River basin there are scattered mixed farms which usually have small areas under orchards, but also engage in vegetable-gardening, bee-farming, poultry raising, dairying, and fresh flowers. The main centres are Cardiff, Toronto, Dudley, Charlestown, Wallsend, New Lambton and Adamstown, and the minor importance of orcharding is shown by the fact that there are only eleven orchards with a greater acreage than five acres; seven acres is the biggest, and altogether on 136 farms which have orchards the average size is only 1.76 acrs.

Pioneer Settlement: An Attempt at a Synthesis

By JOHN ANDREWS, B.A.

We have been accustomed in popular speech to use the word "pioneer" in several senses. The pioneer of last century was the man who pushed the frontiers of civilisation a little further into the unknown; he opened up new country, began new settlements and introduced a new race. Milton uses the word to mean "one of a body of foot-soldiers marching in advance with spades, etc., to prepare the road for the main body." But the pioneer, who is an "original explorer," is now the exception, for there are not many areas of this earth where there is still scope for such. The American overlander, the Australian squatter and the South African trekker have given place to the farmer and settled pastoralist, whose movements are shut in between the fences of their holdings. There are now in most lands no far horizons, no Terrae Incognitae, to attract the settler. The average man who earns his living from the soil can look to no fresh woods and pastures new, but must rise above his fellows and above the difficulties of his surroundings by intellectual journeys in the fields of experimentation and resourceful development.

Changing conditions and the growing complexity of modern life have given rise to new refinements in the use of the word "pioneer." The present-day pioneer has his lot cast in a different mould, though he may employ the same qualities of endurance, foresight and resourceful determination as did his forbears. He is still the "beginner of enterprises," though the enterprises consist of the development of changing adaptations of the use of the soil in accordance with changing opportunities.

THE THREE ZONES.

The habitable lands of the world may be classed in various ways, but the classification here suggested and used has the advantage of simplicity, while it may be extended as our knowledge advances. It is none the less fundamental. All habitable lands, then, fall into one of three groups, according to the opportunity they offer the settler. They may belong, in the first place, to *the zone of choice*. Here conditions are favourable to settlement, and the settler may follow one of several possible lines of development without disadvantage. The farmer of the Far North Coast of New South Wales may, if he be situated on the river flats, devote his holding to the cultivation of sugarcane, to maize, to dairy-farming on sown grasses, or to the growing of fodder crops. Possibly he may carry on all these. The ranchowner in the Argentine pampas may use his land for raising stock on the natural pampas grasses; for growing lucerne to provide additional food for the animals; for cattle raising or sheep raising; or may hire it out to share-farmers who raise wheat on it. In the lands within this broad zone, then, there is considerable flexibility in man's relations with the soil, and it lies largely in his own power to decide his reaction to it and the form his settlement shall take.

The second zone presents a less attractive picture. The areas within it are habitable, but the conditions are such that the lines of activity are narrowed down to one. In this *zone of determination* all settlement is cast in the one mould. The sum total of conditions is such that there is only one possible use of the soil; though the determining influences may be dominantly climatic, topographic, economic and so on. Examples are the sparse grazing lands of the hot semi-deserts or of the tundras; high mountain pastures, where topography and climate alike prevent agriculture; hot, wet forests with small-scale garden cultivation; river-bottom lands in The East, where pressure of population, high value of land and the large yield of rice crop make the growing of rice inevitable; isolated savanna regions, such as Northern Rhodesia or North Australia, where cattle-raising is the only suitable occupation—in a word, regions of difficulty of all kinds. One would not rationally endeavour to raise wheat either at Milparinka or in the heart of Sydney, while sparse grazing is alike the only possible activity under present conditions in the hot deserts of the Sahara and the Colorado and in the cold deserts of Central Asia and Arctic Canada.

In addition to these two major zones there is a third, which may be called *the zone of intermittent opportunity.* Here the limits are often rigidly set; but at times, more or less frequent, opportunities for differentiation are offered. Thus the creation of a tariff against imported tobacco presents an opportunity to local farmers. Before man learnt to control the river, the Nile, the Euphrates and the Tigris brought with their floods a gift from the gods of rain, although too lavish or too miserly an offering was equally useless. On the arid fringe of the farming belt there come years, singly or in groups, when farming may be indulged in successfully and securely.

Dr. Isaiah Bowman has made a study of a region on the arid fringe around Jordan in Montana. (I. Bowman, Jordan Country, Geographical Review, Jan., 1931, p. 22.) The conditions described in this study, however, persist over a very large belt stretching from Central Texas into Canada, and are also found to a greater or lesser extent on the arid fringes of all the great wheatlands of the world.

With the high wheat prices that prevailed after the Great War there was everywhere extension of the wheatlands into regions of less favourable conditions. In Montana (U.S.A.) dry-farming began on land that had formerly been cattle or sheep ranches. Not all the land, of course, could be used for wheat-growing, for soil conditions and topography vary fairly widely. Generally the river bottoms were irrigated for lucerne flats, while the higher slopes remained grass pastures. But there are extensive areas of subdued relief over which soils are suitable for wheat and which can be farmed by machinery. The soils are fertile, particularly in the first years of cultivation, while costs of production are fairly low owing to the low purchase price of the farm, absence of clearing and other improvement costs, and the low cost of labour owing to the use of machinery. One factor, however, introduces a very big element of uncertainty. While one may not be able to define it exactly for any particular region, it is obvious that wheat growing (as any other cultivation) requires a certain minimum precipitation of rain or snow for successful growth and ripening. On these arid fringes the precipitation, both in the annual and the seasonal amounts, has decreased so far below that of the wheat optimum belts that it often falls below the minimum requirements. From the point of view of the farmer the years are divided into good and bad years, the first being those in which he can grow wheat, and the second those in which he cannot. He cannot predict the character for even one year ahead, and the good years come singly or in groups, but apparently in quite irregular fashion. Now, as compared with farms in more favoured areas where the precipitation is sufficiently far above the minimum requirements for amounts proportional to those which make all the difference between good and bad years in the delicately-balanced arid fringes to be practically unnoticed, the dry-farming regions appear to suffer from very variable rainfall. But an examination of the facts does not bear this out, at least for Australia. It is the disproportionate effect of variations from the usual that gives rise to hasty generalisations about reliability and variability.* Since the farmer cannot place his whole trust in wheat, he has to decide each year how much area he will give to cultivation and how much reserve for his livestock. Should the year be a bad one, he may be forced to cut all the crop for winter fodder. For the size of his flocks and herds this will probably be far too much, and he cannot dispose of the surplus since everyone in the district is more or less in the same position. A good deal will probably be wasted, and to this waste must be added the original cost of planting and harvesting this expensive crop. Even if the rainfall is sufficient to produce a fair head of grain, a poor yield per acre will not pay the expenses of growing and marketing it. A few years of such failure will exhaust the farmer's resources and destroy his credit. The farm is abandoned (either entirely or as a wheat farm), and the land reverts to pasture.

On the other hand, if fortune favours the farmer with a sequence of good seasons, the money return is usually sufficient to enable him to build up his farm in various ways and to provide for the inevitable swing of the pendulum.

The emphasis in such areas is constantly upon the initiative, judgment and adaptability of the farmer. The opportunity is offered, but there is no rest from experimentation and struggle.

COMPLEXITY OF ZONAL FACTORS.

Now, the factors that decide the zonal character of a region are neither simple nor constant. In some cases they are dominantly physical, as in the cool highland grazing lands of the Monaro or the Scottish Highlands. In other cases they are dominantly social, as in the age-old agriculture of the Chinese; political as in the farmlands of the U.S.S.R.; or economic as in the one-crop farming belt of the grain lands of Australia or U.S.A. But in many cases the interplay of these factors is so complex that experience and training are necessary to appreciate the importance of each.

Besides being complex, these factors are usually not constant. Apparently the Saharan region has changed in historic times from a more or less fertile zone of choice to a zone of determination because of increasing aridity. The clearing of the forests and the consequent soil erosion has converted zones of choice in the Mediterranean basin and the hills of Southern China into zones of determination with sparse grazing. The planting of pine trees and special grasses in the Landes of the Biscayan coast has converted unpopulated shifting sandhills into productive turpentine forests. Changing political conditions have many times in the world's history changed fertile farms and prosperous cities into wildernesses for the jackals. The laying waste of Northumbria (Gt. Britain) by William the Conqueror in 1068 was reflected for centuries in the restricted activities of the population. The politico-social conditions that led to the colonisation of North America and Australia changed the whole aspect of settlement in these regions. The economic factor is particularly important in this ringing of the changes. In the early days of the colony of N.S.W. the wheat requirements were supplied by import and then by cultivation along the banks of the Nepean, and at Bankstown, Parramatta, Rosehill. With the crossing of the mountain barrier the pent-up flood of pastoralists was released westwards. Until the wave of farmers caught them up, the squatter's domain was a zone of determination. But the wheat farmer followed the stock-owner, and the wheat belt moved westward to the slopes and plains. Wheat is now almost unknown on the farms of the original counties. Economic conditions have led hundreds of farmers to "flee from the land" in all parts of the world. Abandoned farms are a common sight in the New England states of North America. Competition has led to the failure of rubber plantation in the Amazon; to a change from citrus cultivation to part citrus and part dairying in the Gosford district of N.S.W. Economic encouragement resulted in the planting of thousands of acres with cotton in newly-opened lands in Queensland. Instances of this order are, however, numerous and easily ascertained.

---

* See Proc. Linn. Soc., N.S.W., Vol. lvii., pts. 1-2, Rainfall Reliability in Australia, J. Andrews.

The relation of man to the soil in any one of these three zones is, therefore, dynamic rather than static.

THE ZONE OF INTERMITTENT OPPORTUNITY.

Pioneering is almost exclusively carried on in the zone of intermittent opportunity. The changing nature of the opportunity offered calls for a high degree of flexibility in the relationship between the settler and the soil, and demands in the fullest measure those qualities we associate with the pioneering spirit. Generally speaking, there are certain definite types of pioneer settlement though the great variety, resulting from the interplay of physical and social conditions showing the influence of diverse stages of development and being spread over different times, cultures and economic systems, make it difficult to classify them.

Let us examine some pioneer settlements from the fundamental aspects of distribution, function and morphology.

WHERE ARE THE PIONEER LANDS?

It follows from what we have said of the complexity of the forces at work in the pioneer lands that the zone in which they are included is not a continuous belt on the earth's surface. In New South Wales, for example, there are several zones of intermittent opportunity, each with characteristic pioneer settlement. In the present state of our knowledge it is not possible to show the pioneering lands on a precise map. By arranging the known examples in groups, however, we can fill in part of the picture and sketch the lines along which it will be completed.

For the purposes of the present study the following groups are important.

(a) In regions of inefficient precipitation.

The best known examples in this group are the regions of the arid fringes of the great grain belts, e.g., the western dry plains of North America, the dry steppes of the U.S.S.R., the western edge of the wool-wheat belt of Eastern Australia, the western edge of the Argentine pampas. These all show similar dry-farming characteristics, a good example being that of the Jordan (Montana) district described above.

The term "inefficient precipitation" may mean excessive precipitation as well as deficient, since the character of the precipitation from our point of view is considered relative to crop requirements. Thus on the wetter fringe of the wheatlands may be found regions in which rust and other handicaps take the place of undependable or insufficient rainfall. Usually, however, such regions are in the zone of choice.

In the same way pioneering conditions are not usually found in old-settled regions of high rainfall unless under the influence of some special factor. Such a case occurs in many regions in China, where physical conditions are not suitable for an irrigated crop, but pressure of population, high value of land and heavy yield from rice compared with other grains make rice-growing inevitable. The economic factor is specially important in this connection. In Australia, under offers of financial assistance from the various Governments, efforts have been made to cultivate such crops as cotton, tobacco, coffee and so on. The acreage under cotton has fluctuated violently, and the crop has been planted in regions unsuited to it. (See this Journal, vol 1, No. 3, p. 68, Tropical and Subtropical Agriculture, J. Andrews.)

An example of the persistence of pioneering conditions in even a fairly old-settled region is found in the north of Venezuela in the Segovia Highlands and the Paraguana Peninsula. Most of the region is an upland of moderate dissection giving a rolling surface. The upland surface is mainly covered with grasses and scrub, while the soils are light, sandy and coarse. They are rich enough where the land is irrigated, but generally lack plant food in the form of humus. The latitude is about 10° N., so that high temperatures prevail. The rainfall is only some 20 inches per year, but with high temperatures the effective rainfall would be considerably lower because of increased evaporation. Some of the upland slopes and marginal valleys receive more than this, and here are grown coffee and cacao.

On the upland surface, though, the rainy season is from September 1 to December 1, and much of it may experience total drought for six months of the year. Settlement in such regions would naturally be sparse, but conditions are also affected by the variability of the rain. Settlement has been carried on in two forms: the permanently cultivated and the intermittently cultivated. The first is the irrigated area along the rivers and on the alluvial flats, where the water supply is reasonably constant. The second is the area that is irrigated when the water supply is sufficient and abandoned when it runs low, and also the area that is dry-farmed during years of super-normal rainfall. Of the two groups the intermittently cultivated is the greater in extent. The crops grown are corn, cassava, sugar and beans.

Grazing is the normal activity, and is usually confined to goat-herds. The grasses grow during the rainy season, but die with the beginning of the drought. In the Paraguana Peninsula they are grazed in small herds by sedentary peoples, who lead them into the more desert areas during the rainy season and retreat to wetter areas or to irrigated pastures in the dry season. Considerable adaptation is necessary when rains are so scarce that the usual semi-desert pastures are useless and the irrigated areas form the chief sources of food.

Another example of a pioneering people is that of the Hopi Indians of north-eastern Arizona. They inhabit a very dry region in which most of the fields are found on drifting sands in the bottoms of the valleys or near some spring. The sandy soil conserves the moisture, and the constant drift of wind-blown sand prevents too rapid evaporation by forming a surface mulch. Corn is grown in these fields successfully, but often strong winds will remove the sandy surface in spite of wind-breaks, and cultivation must be begun in new areas. Before the Spanish era the Hopis grew and wore their own cotton for clothing; they cannot be considered either less energetic or culturally poorer than many peoples in less difficult regions.

(b) In regions of inefficient temperature.

The temperature factor is an important one in farming or pastoral settlements, particularly in such aspects as length of growing season, frequency and time of occurrence of frosts, diurnal ranges and so on.

The best known examples of the influence of this factor are to be found in the grainlands of the Northern Hemisphere on their northern margins. The grain-growing belt stretches across the Eurasiatic land mass, with its northern limits in the Scottish and Norwegian highlands, the Finnish and Russian plains to the vast areas of Siberia and Manchuria. In North America it crosses the interior plains in Canada and the Dakotas. Just as in many areas the grain-growing belts have been extended into the arid fringes, so they have been extended into the cold fringes on their northern sides, often with similar results as regards permanency of occupancy of the farms.

In the case of the Canadian wheat fields, the most important climatic influence is the length of the growing period. In early winter the ground cracks with the intense frosts, and so it is not possible to follow the methods of Central Europe and sow the crop in the autumn. It is sown in early spring, as soon as the frosts appear to have ended. Most of the rainfall of the year falls in spring and summer when the crop is growing, and there follows a dry, sunny autumn, when the grain ripens and is harvested. Over most of the Prairie provinces the growing period is usually about 110 days. It decreases fairly rapidly to the north and east, though some areas along the rivers may enjoy a longer period than the surrounding country. This last fact is important, for example, in the Peace River country, where large-scale development has been taking place in recent years along prairie lands on the river banks. Naturally, on the cold margin of the wheat belt are found areas in which most conditions are suitable for wheat growing, but the growing period is so close to the minimum length that farming is precarious. A succession of years in which the winter is unduly severe and protracted or in which late frosts or night frosts injure the growing plants may well cause the ruin of the farmer and the abandonment, either absolutely or as wheatland, of his farm. To cope with such risks, the old-time specialisation in wheat is giving way to a system of mixed farming, in which such hardier crops as oats, barley and rye, which can grow in colder areas with shorter growing periods than can wheat, are the main crops, sometimes rotating with wheat and sometimes taking its place.

In a similar way pioneering conditions are to be found in Manchuria, where the wheatlands are situated the furthest north of the agricultural lands.

In the Scottish Highlands and the islands off the west coast of Scotland conditions are again very difficult for the farmer. The climate is oceanic, as opposed to the continental climate of the Canadian prairies, so that rain falls all the year, with slight spring and autumn maxima. Owing to this frequent rainfall, the hours of sunshine are considerably less, and altogether the growing period probably shorter. Although cereals are planted in many highland crofts and on the farms of the west coast and highlands, very often the crop is cut for hay. Wheat does not ripen in the west because of excessive rainfall and low temperatures. The farm economies are more established, though still delicately balanced, than in newly settled lands such as Canada and Manchuria, and adaptations to changing conditions are more in the nature of changes in farm organisation. The expression of the difficulty and hardship of the life of the highland crofter is the extensive decrease in rural population. In many areas former arable land has been converted into permanent grassland, whose chief use is for pasturing cattle and sheep, an utilisation that results in surer returns but needs fewer rural numbers than does agriculture.

One of the best examples of intermittent occupation spread over several centuries is afforded by Greenland. Here Eskimo have attempted to colonise various regions at different times. Last century the only portion of East Greenland known to be occupied permanently by Eskimo was at Angmagsalik, but expeditions to the island have found at various parts of the east coast relics of earlier Eskimo habitations of different ages. During last century there was going on a migration from the east to the west coast, where settlements are more frequent. It was also on the west coast that Norse settlers tried to establish themselves between the tenth and the sixteenth centuries. Forgotten in the latter part of this period, they were found to have died out when exploration was renewed. At the present time the Danish Government is endeavouring to colonise parts of the east coast with Eskimo, and there are Danish and Norwegian settlers as well.

High temperatures have proved just as much an obstacle to permanent settlement as low temperatures. In the tropical regions of the Guianas in South America the soils are fertile and productive and the rainfall high. Temperatures, however, are also high, and the hot, moist climate favours the perpetuation and spread of tropical diseases. Until recent years, when the advance in medical science enabled some of these evils to be overcome, the "White Men's Graves" of the tropics saw many a settlement started, only to be destroyed by disease and abandoned by the survivors.

Temperature may play a large part in determining the nature of settlements in mid-latitudes also. The importance of the length of the growing period to the wheat crop is paralleled by the importance of the length of the frost-free period to the cotton crop. Cotton was indigenously a sub-tropical crop, but is now grown very intensively in the southern States of U.S.A. between 30° and 35° north latitude. The northern margin is restricted by greater frequency of frosts due to more inland conditions of climate. For the production of the best bolls it is essential that the plant should experience a period of at least 200 consecutive frostless days in spring, summer and autumn. North of the line bounding the regions where this condition is satisfied there is very grave danger of either early spring or late autumn frosts ruining the expected crop. "Sometimes in the more extreme parts of the area, as in Texas, cotton is planted before all probability of a killing frost has disappeared, and the whole crop may be destroyed through the coming of a late frost. This happened in Southern Texas in the spring of 1922, and led to extensive replanting throughout this area, and also to the farmers turning to other crops because of the scarcity of seed cotton." (North America. Jones and Bryan (Methuen.)) This process is a fairly common one, and owing to the relative value of the cotton crop it is often reversible, the farmer replanting with cotton in the expectation of more favourable weather conditions. These features are especially notable in the newer cotton lands of Texas, where the cotton belt has not become so well defined by long experience as it has in the Mississippi lands and the Piedmont region of the Atlantic coastal plain.

Temperature conditions are important in the cultivation of bananas on the North Coast of New South Wales. There is an indefinite boundary south of which the banana does not produce fruit of marketable quality except in exceptionally favourable years. At Coff's Harbour banana plantations thrive under suitable conditions of aspect and absence of killing frosts. South of this, however, plantations have been abandoned because of continued failure, though, on the other hand, some farmers market a banana crop every second year or so. Bananas are grown in cottage gardens in Sydney, but usually the fruit is of poor quality and is often worthless.

(c) In regions of inefficient soils.

The soil factor is particularly prominent in bringing about pioneering conditions, for in the nature of things soils are liable to exhaustion after exploitation, and must be allowed to recuperate. In the more primitive stages of agriculture the cultivated patch is usually abandoned when its fertility declines, and the cultivator moves on to another patch. This is typical of the forest-clearing agriculture of the tropics in Africa and South America at the present day. The practice of the powerful banana-growing companies (such as the United Fruit Co.) of Central and South America was to abandon the plantations after some years, when the yields diminished, and to plant elsewhere, though in more recent years experiments are being made with other tropical crops which can be grown while the soil is recuperating. At the other extreme of the climatic scale may be found regions in high latitudes where the soil is nearly always frozen so that after one cropping the plant foods are replaced so slowly by the normal processes that they may require years of fallowing before cropping again. Ogilvie, in his "Geography of the Central Andes," mentions soils of this type that can be cultivated only once in twelve years.

Most soils require changing adaptations. In one-crop farming regions such as the wheat belt or the cotton belt of North America continuous cropping produces decreasing soil fertility. The yields usually fall off fairly rapidly in the first years, then more slowly to the minimum. In most regions of old-established agriculture measures must be devised for overcoming this tendency, and this is done usually by rotation of crops or by use of fertilisers. By means of the two methods combined, Chinese farmers have fed enormous numbers of people for hundreds of years from the same fields.

Where this natural tendency towards impoverishment with exploitation occurs along with other factors, we often find examples of intermittent occupation. One of the most striking examples is the region between the Potomac and the James

Rivers, on the western shores of Chesapeake Bay. This is part of a low-lying coastal plain, but the land surface is undulatory, with fairly well marked ridges between the river basins. The land along the river banks is apt to be marshy and swampy, but the higher areas were originally forest-covered. As in most temperate regions which have been forested for long periods, the soils are light-coloured and thoroughly leached, particularly on the upland divides where they are residuals, and have not been covered by transported soils as have the lowlands. When cleared and used as farmlands these inland soils have as a rule proved incapable of bearing crops for any considerable period. Abandoned farm-houses are common, and since the settlement of the region in the early days of colonisation there has been going on a process of abandonment, resettling and abandonment again. Not all of the region is of this type, for some areas contain prosperous farms on what appear to be much better soils. Nor is the soil factor the only influence at work, for farm abandonment due to economic causes as much as to geographic is a well-known feature of the north-eastern states of the U.S.A. However, when strong efforts are made to combat the inherent infertility of the soils in this region by fertilisers and crop-rotation, the results are very greatly improved, even though the additional costs of production are very high.

In most arid regions the soil cover over large areas is a light sandy one. In periods of sub-normal rainfall, the vegetative covering largely disappears, so that the binding qualities of its roots are lost. Therefore, much of the surface soil is removed by the wind, and while sand dunes accumulate in some places, in others the surface may be stripped down to a hard clay pan, which offers no inducement to vegetation when the drought is broken. Thus land which formerly carried a fair density of stock may be rendered infertile for years. The same condition may be brought about by other factors operating with those mentioned. Over-grazing will deplete the vegetation to such an extent that only a comparatively small decrease in the normal rainfall will achieve the same results. Also in many areas the vegetation has been cleared to plant a crop which on light, porous soils and with low rainfall had small chance of permanent success. Whatever the first results, the land is usually abandoned and sand drift sets in on the stripped fields. Examples of this are to be seen in Wisconsin and in Western Australia. Sometimes these lands can be reclaimed by careful treatment of the vegetation and by guarding against over-grazing.

(d) In regions of high altitude.

The great and high massifs of the world are all arid. Below the snowline in the Asian massif and in those of the Americas there is a zone where precipitation is very scanty and the intermontane basins are desert-like in character. Even in the marginal zones of those massifs where rain-bearing winds deposit heavy falls, as in British Columbia in the Canadian Rockies, many of the deeper valleys have arid floors. The settler has therefore often to contend against several unfavourable conditions in high mountain regions—namely, cold, aridity, paucity of soil cover due to generally steep slopes, limited extent of cultivable land, difficulty of communication, and so on.

The Andes provide many excellent examples of all types of mountain settlements, and they have been fairly well investigated.* Some of these settlements exhibit the chaarcteristics of pioneer settlements.

In the Maritime Cordillera in Peru there are to be found below the snow-covered volcanic peaks of the Cordillera a region of rolling upland country crossed by broad valleys and bordered by canyons. On these uplands there is sparse pasture extending almost to the snowline, and shepherds' huts are to be found at elevations up to 17,000 feet, though most of the dwellings are clustered in sheltered valleys. Owing to cold, aridity and the porous nature of the volcanic soil, the pasturage is very thin and dependent upon the infrequent rains. When these occur the flocks of sheep and llamas are driven out of the valleys and away from the irrigated alluvial pans to the intermittent pastures of the uplands. When dryness prevails, the oases in the canyons have to support the upland herds as well as their normal inhabitants. If the rains or the snowfall drop sufficiently low many may leave even the oases and migrate to adjacent mines, thereby changing from agricultural or pastoral occupations to mining. Other cases have been discussed of migrations during very dry periods on one side of the Cordillera to the other side where conditions may be somewhat better. At the present time, the upland pastures are occupied by Indians of a type inferior in general ability and wealth to those of the cultivated valleys. The life is so chanceful that only the poorer classes will follow it.

In the Puna de Atacama there is an upper belt of pasture at elevations between 10,000 and 13,000 feet. Valleys lead from this upland down to the borders of the coastal desert, which lies between 5,000 and 8,000 feet, and they contain scattered oases about the water-springs. In winter, the upper pastures are much too cold for the flocks, which are driven down to lower levels, where they find themselves bordered by the desert. "Some of the shepherds make their permanent homes in the oases of the lower belt of pasture; others in the upper belt. It results that in winter the highland dweller is a nomad in the warm valleys, and that in summer the valley dweller is a nomad in the high pasture country." The opportunities offered in the summer in the high zone are definitely related to the amount of moisture available for the pasturage. Sometimes the shepherd maintains two dwellings, one in the high pastures and the other on the borders of the oasis where he can obtain winter feed for his animals.

---

*See Dr. I. Bowman, inter alia, "Andes of Southern Peru."

An example of a rather different type may be gathered from the region of the Apurimac River in Peru. Here the precipitation is higher in the mountains. Below the snowy summits there is a zone of grassland, then a zone of woodland in the region of greatest precipitation, then at lower elevations another zone of grassland. Below this the mature slopes of the high country are broken by steep-sided, deep canyons. The floors of these are usually arid, and have a desert-like scrub; with the aid of streams descending from the snowfields or the woodland the alluvial pans may be irrigated and sugar-cane grown. The most interesting area, however, is that of the upland spurs in the lower grassland zone. The spurs naturally receive more of the streams from the higher slopes, though they are covered with grass. Sometimes small canals carry to them water from the streams of the woodland for the stock, but in many cases the spurs are intermittent pastures, the stock being repeatedly driven over them and then back to water.

The final example is taken from the coastal deserts of Chili. The desert reaches up the mountains to about 8,000 feet, and is utterly waterless except on the inner edge where the mountain streams abut on the desert slopes. These streams give rise to oases of agricultural settlement, each being small and isolated. They support the flocks and herds also for the greater part of the year, but in the spring there is some scanty pasture on the mountain slopes, and after the occasional rains of the desert borders there is temporary grazing. Thus there are irregular movements outwards from the oases in the times of pastoral opportunity in the less favoured areas.

These are some of the facets of mountain settlements in the regions of difficulty. While not being at all exhaustive, they indicate some of the conditions the pioneer settler in such conditions must contend against.

(e) In regions of unadjusted occupation.

Hitherto we have been dealing with settlements in which the dominant influences have been physical. A very large class are dominantly affected by social, economic and historical influences, and of this class some of the most interesting examples are those which fall under the above heading. This includes settlements in which the character of the settlement has not yet become adjusted to the environment; the majority of such settlements naturally being found in regions of comparatively recent occupation.

The settlement of new land always provides problems which may prove very difficult of solution. The early British settlements on the coastal plain of North America passed through many vicissitudes before they were permanently established. The climate was of a type foreign to the settlers, and not many of them had agricultural experience. Moreover, new types of cultivation were required under the new conditions. Disheartening failures, such as those of Raleigh, were common, and the settlements were dependent on supply ships for many years, until the characteristics of the environment were recognised and the settlements adjusted accordingly.

The process was repeated in the colonisation of New South Wales, and for many years the settlement at Sydney Cove was precariously placed as regards its food resources. The novelty of the environmental conditions and the lack of knowledge of the settlers in all these cases made inevitable a process of trial and error, until the final adjustments were made.

In the popular sense the term "pioneer" is most readily applied to settlements of this type. In Australia at the present time they are represented by the settlements in North Australia, which are experimenting in tropical agriculture. A much larger group are the cattle stations, which are pushing out into the unknown arid areas. In the Kimberleys are to be found isolated outposts of this kind, occupied by two or three white men, whose cattle can be grazed over hundreds of square miles. With growing experience of the conditions, the poorer lands are abandoned or reduced in importance, and the stockman concentrates on the better lands. Each new station is also an experiment on the economic side, for the stock must be driven long distances to the markets, and the margin of profits may disappear in the face of unfavourable fluctuations in prices. Many other factors can only be learnt by experience, as for instance the relative carrying capacity of the land in wet and in dry years, the liability of the stock to diseases and other accidents, and so on.

An interesting modern example of the agricultural settlement of new land comes from Hokkaido. This island lies sufficiently far to the north of the other three of the main Japanese islands to differ considerably from them in climate. The winters are very cold and snowy, and the summers are hot but short. One result of this is that rice, the main crop in the warmer climate of Old Japan, is much less important, and legumes, potatoes and cereals are the chief crops. The island is still largely unsettled, only about half of the arable land being occupied. Much of the remainder is virgin forest. The number of farms is growing, however, partly as a result of immigration from Old Japan, and settlement is progressing into the forest along the lowland plains. The farms are very different in appearance from those of Old Japan, and much more like farms in our own newly-settled farmlands. In the more recent types the hills still bear virgin forest, while the ploughed fields contain ringbarked trees and stumps left standing. The farms are much larger than those of Old Japan, the average size being 9½ acres, as against 2½ acres. As the advice of certain American experts had been sought in the planning and subdivision of much of the newer farmlands, the plan adopted was often that of the American rectangular field and road pattern. This leads to a disseminated type of occupation, with certain small agglomerations whose function is mainly social. Agriculture is extensive, and irrigation is unusual. The house types are very varied, for migrants from all parts of Old Japan have brought with them features of their former habitations, and these have been mingled with features of the American log-cabin and frame-house, and the Ainu grass-and-reed houses. Some of these house-types are not suitable for the climatic conditions, and probably a definite type will eventually establish itself.

It should be realised that in practically all the points mentioned the Japanese settlers are living and working under different conditions from those obtaining in their former homes. In the recently settled areas they are still adjusting themselves to this new environment, and in the process experimenting along several lines in their agriculture and ordinary ways of life, and making continuous adaptations.

One further example in this series of unadjusted settlements is worth noting. In several districts in the coastal ranges of California (as in the Lockwood district) a reorientation is in progress in the farm economies. After occupation by the present type of farmer this district became a specialised wheat-farming region. Yields and prices were sufficiently high to allow of the farmer devoting himself exclusively to wheat-growing. In more recent years decreasing yields, which are a consequence of decreased fertility, bring the returns below the economic line, and the farmer is faced with bankruptcy. Many farms were abandoned or sold; other farmers bought up such land and, using a system of fallowing, increased their total production by increasing their acreage. As they also increased their capital expenditure and rates and taxes, this was only a temporary expedient. Others are experimenting in the direction of mixed dairy-farming, the dairy products being sent to the city markets. Whether this is successful or not, it is evident that these areas cannot continue as specialised wheat farms, and some adjustment must quickly be made.

In the Gosford district of New South Wales it was found unprofitable in recent years in view of serious competition from various irrigation areas to replace the old citrus trees. Thus many farmers that once produced only citrus fruit are turning some of their energies to dairying or to vegetable-growing. This readjustment brings about many changes in the routine and organisation of the farm.

(g) In regions of economic instability.

Many regions offering intermittent opportunities do so as a result of the instability of economic conditions, and examples of such are quite common. The imposition of a tariff, for instance, gave rise and impetus to the chicory industry in Michigan; cotton-growing and tobacco-growing in Australia have fluctuated with the assistance given by Governments. During recent years the fall in prices of wheat has led to increased production, as in Australia, when a record acreage was sown in 1930-1. Prices were so low, however, that Government assistance had to be provided for the farmer, and much of the grain was left in the fields. The following season many thousands of acres reverted to grass.

Peattie gives an interesting example from the foothills of the Pyrenees.* Here are to be found along the rivers terraces formerly used for vineyards when labour was cheap and markets, both local and distant, were available for wines. Then came a change after the war, when labourers were scarcer and wages higher. The terraces were abandoned or used for other crops, until in recent years higher prices of wine have brought the vineyards back.

Many examples of the influence of this factor might be given. There is especially a need for the investigation of its influence on the settlement of the sparsely-occupied interior grazing lands of our continent.

(h) In regions of historical handicap.

In a smaller number of cases we find factors at work which are dominantly social in character. The region of the Mongolian steppe outside the Great Wall of China illustrates this. The wall was built for protection against raids and invasions from the semi-arid areas; the Chinese farmers in troubled times remained inside it, but when danger seemed past they ventured out into the fertile grasslands. At the present time they are moving forward in what has promise of being permanent occupation. The Wall at least will not provide much protection in days of modern warfare.

(i) Mining regions

The last series we have space to discuss is that of mining settlements in inhospitable regions. The interior of Australia contains many examples. Tanami, a goldfield in North Australia, fluctuates considerably in population in accordance with the frequency of promising yields. Coober Pedy, in South Australia, is an opal field where the heat is so intense that most of the inhabitants live underground in dugouts. In both these settlements the presence of minerals has led to temporary and fluctuating occupation.

Usually the development of mining communities in these inhospitable areas leads to experiment in other directions. Thus agriculture in Alaska received an impetus from the cultivation of market produce under hot-house conditions for the mining towns. In Broken Hill are to be found irrigated gardens and market gardens in a region which, but for the presence of the mineral deposits, would be very unlikely to attract them. Similarly the mining communities of the Rockies provided ready markets for the products of the newly-irrigated areas of the arid mountain slopes.

---

*R. Peattie, Geog. Rev., vol. 20, 1930, p. 245, The Conflent.

THE CHARACTERS OF PIONEER SETTLEMENTS.

We have thus reviewed some of the more obvious and better-known instances of pioneer settlements and the conditions which have influenced the development of their special character. From such an examination it is possible to generalise that pioneer conditions are to be met with in the most common and pronounced form in the regions of difficulty, such as those of the arid fringes, the torrid and frigid fringes, high mountains and poor soils. They are found in most areas of recent occupation and in areas of economic or social instability.

We can now arrange our examples in regional groups, some of the more important regions of pioneer settlement being as follows:—

(1) Regions of general farming difficulty in temperate latitudes. In this connection, we have discussed farms in New England and the Chesapeake district.
(2) Regions of arid fringe farming in newer lands. The example quoted at length of the Jordan country may be taken as generally typical of such regions in Australia and elsewhere.
(3) Desert and semi-desert settlements. They are very varied in type, but are usually dominantly pastoral. The cattle stations of central Australia are typical of such settlements in newer lands.
(4) Regions of recent occupation in new lands. These are also very varied in character and morphology. The recent agricultural settlements of Hokkaido represent one large class. Settlements in tropical regions belong to this regional group.
(5) Regions of high mountains. The Andean examples described may be taken as typical.
(6) Regions in high latitudes.

Of these, the first, third, fifth and sixth are regions of permanent pioneering. In such only the removal of the urge to more intense development than the land will permanently sustain (i.e., the pioneering spirit), by some change in the conditions of population pressure or economic organisation or other means will change the pioneer character of the region. They will be developed to their fullest extent with the aid of complete understanding of the various factors involved and by taking advantage of the favourable elements of the environment. That they are not to be regarded as debit items in the balance sheet of a nation's lands is shown by the record of the pioneer zone in many lands in producing progressive and competent human types.

The second and fourth of our group are usually regions of temporary pioneering. Finer adjustments usually bring increased security and less dependence on the intermittent element in the environment. But the finer adjustments are the outcome of experience and the gradual intensification of occupation. Generally speaking, the element of uncertainty is the result not so much of unfavourable factors in the regional conditions as of unsuitable utilisations of resources.

Lines of Study.

The study of pioneer settlements must proceed by the accumulation of regional analyses such as those mentioned above. By this means, and by comparative study of such analyses will our knowledge be broadened of the factors that go to make up pioneer conditions and pioneer life. The practical importance of such study becomes obvious on reflection. With the aid of scientific appraisal of the chances on which such settlement usually depends, of the lines along which particular types of settlement will evolve, by patient and far-seeing planning of development based on investigation of the regional characters, the effectiveness of occupation and the historical impetus—by these means the student of settlements can render valuable service. Under conditions of world competition, there can be small room for the haphazard, individual, trial-and-error methods of past generations, though trial-and-error may be valuable experimentally, and so will persist to some extent. Science is being increasingly called upon to supplement individual effort with co-operative planning and collective discipline.

Rural Population in New South Wales

By G. WHALEN, B.Sc.

The Australian people are considered to be a town-loving people. That there is some truth in this is evident from table I., which shows that in 1921 the population of the metropolis and towns above 500 people in size made up some 77 per cent. of the total population of New South Wales. This is unexpected, since New South Wales is a newly settled country, and might be expected to have a dominant rural population rather than a very disproportionate urban population.

The discrepancy between rural and urban numbers is usually accounted for by the often-repeated expression, "flow to the city," without regard as to whether such a tendency is real or only imaginary.

Nowhere in New South Wales are there large acres of land now deserted which were formerly settled. It is undoubtedly true that such would exist if there were a desertion of the country for the city on any noteworthy scale, such as in the rocky New England region of United States of America.

Yet, on the other hand, the rural population is not appreciably increasing either absolutely or proportionally to the metropolis or the municipalities (see Table I.). This slower increase in the rural population is understandable when the change from primary production to industrial which has taken place since 1901 is considered. Until about 1881 settlement was active, since good lands were still available, although fast becoming scarce, and so this accounts for the rapid expansion and growth of the rural population. Since that date development has supplanted active settlement with a decided decrease in the rate of increase of the rural population. Now the farmer is faced with the problem of setting up his family on his own land or sending them away to the city or to a larger town to find employment there. The former way is limited by the amount of development possible under the prevailing economic conditions The latter way is the easier, and is practised more often. The individual members of the family, with the exception of perhaps two, move to the city to find employment. The "flow to the city" does exist, not in a form of desertion of the country, but as a movement of the natural increase of the country to reinforce the natural urban increase. This movement is dependent upon the economic conditions. In times of stress in rural centres, such as the decade 1891-1901, when continued bad seasons and poor market prices prevailed, this movement to the city was strengthened, and almost became a desertion of the country for the city (see Table 2). In times of stress in urban centres such as the present time, the movement is reversed and becomes a "flow from the city."

In conclusion, it is obvious that, as soon as economic conditions allow a more intensive development of rural industries, then and only then will rural population increase proportionally with urban populations.

TABLE I.—DISTRIBUTION OF URBAN AND RURAL POPULATION, 1861-1921.

Year	1861.	1871.	1881.	1891.	1901.	1911.	1921.
Metropolis	95.156	137,596	224,939	383.283	480,976	629.503	899,059
Municipalities and towns exceeding 500 people	47,376	75,003	171,105	356,868	452,418	597,017	716,264
Remainder of State (Rural)	208,338	291,392	355,424	376,643	411,791	412,058	475,582

TABLE II.—PERCENTAGE DISTRIBUTION OF URBAN AND RURAL POPULATION, 1861-1921.

Year	1861	1871	1881	1891	1901	1911	1921
Metropolis	27.1	27.3	30.0	34.3	35.7	38.4	43.0
Municipalities and towns exceeding 500 people	13.5	14.8	23.0	31.9	33.6	36.4	34.2
Remainder of State (Rural)	59.4	58.0	47.0	33.8	30.7	25.2	22.8

TABLE III.—INCREASE DURING EACH DECADE, 1861-1921.

Period.	Natural Increase.	Nett Immigration.	Total.	Increase, Sydney.	Increase, Municipal.	Rural Increase.
1861-71	106,077	47,034	153,111	42,430	27,627	83,054
1871-81	140,382	107,105	247,487	87,353	96,102	64,032
1881-91	211,301	169,465	380,766	158,344	185,763	21,219
1891-1901	226,676	223	226,899	97,693	95,550	35,148
1901-11	247,865	41,748	289,613	148,527	144,599	267
1911-21	318,530	134,692	453,222	269,556	119,247	63,524

Brief Outline of Geographical Discovery by Sea, from 1400 to 1700 A.D.

By F. J. BAYLDON, F.R.G.S., R.N.R.

It will be quite obvious that, in a brief address such as this must be, it is only possible to mention by name the most prominent of those navigators whose labours contributed to our present knowledge of the coast lines of the world, and of those geographers and cosmographers who patiently and slowly pieced together the various reports of the navigators, and thus gave us our maps of to-day. Only a rough total summary of their noble work can be given, without any attempt at detail as to how the work was accomplished or as to the merits and demerits of the individual.

But to fully appreciate the problems and difficulties of those men in bygone ages, it is fatal to project our modern knowledge into the past; it is absolutely necessary to forget for the time being our maps of to-day, and to think only of those which existed a few hundred years ago. Thus at the commencement of the 15th century Southern Europe and Northern Africa were crudely but approximately delineated. Asia was only known from reports of a few travellers, some of whom, like Marco Polo, had travelled overland to China, and by sea from China to India in Chinese vessels, and from India to Africa in Arabian vessels. From such accounts only a very rough outline of Southern Asia could be obtained, grossly inaccurate; some of the East Indian islands were shown, also the eastern coastline of Asia extending into the ocean very far beyond its present limits—probably on account of the travellers naturally over-estimating their day's journey as they travelled to the eastward from the Mediterranean Sea to China or India. The ocean was believed by some to extend from China to Europe, but more generally it was thought that if anyone was foolish enough to sail from Europe to the westward he would fall over the edge of the world into nothing at all. Maps showed no indication of America and Australia.

Always there were adventurous spirits who wished to find out what lay beyond the horizon, where the sky stooped down to kiss the sea, or "what was hid beyond the ranges," and the deserts, but always the difficulty of the cost entailed had to be overcome.

Some appealed to the sovereigns, holding out to them the lure of gold, silver and territory; others appealed to merchants, luring them with hopes of fabulous wealth through trade; and as it was believed that all these objects could be obtained in the Indies, East India Islands and China, so the great adventure became to find a sea route to the Eastern countries, and from this object developed geographical progress by sea.

One great figure stands alone at that time in his wish for geographical discovery solely in the cause of science and knowledge. He was Prince Henry, always known as "The Navigator," third son of King John the Great of Portugal. In 1415 he went to live at Sagras, near Lagos, founded a nautical school there, and tried to get in touch with every traveller, geographer and seaman who could come to visit him and help him to produce better maps, instruments and geographical knowledge. For more than 40 years he devoted his life and wealth to these objects, hoping that his country would benefit thereby. At that time, early in the 15th century, the north and north-east coasts of Africa were fairly well known, but only a small portion of the west coast was known, and no one knew how far it extended to the southward, whether it reached to the south pole or not. Maps of the time filled up the unknown west coast with most horrible, fearsome-looking monsters, enough to frighten away anybody from trying to get there. So Prince Henry determined that he would find out the western and southern boundaries of Africa. Year after year he sent out from one to three expeditions down the west coast, each one getting perhaps just a few miles further than the other, and each one then returning with stories of mutiny or terriby superstitious yarns of what would have happened to them had they proceeded any further. Each time Prince Henry disbelieved their yarns, and endeavoured to impress on other captains the great importance of rounding Cape Bojador, but it was 19 years before anyone was bold enough to sail as far as that cape. Soon afterwards better progress was made, superstitious fears no longer deterred them. Cape Blanco was rounded, and in 1441 some natives were taken back to Portugal. Very shortly it was seen in Portugal what a blessing it would be to those poor natives by taking them as slaves to Portugal, where they could become Christians and thus save their souls. So, in 1444, the horrible slave trade began, which brought untold misery to the West African natives for nearly 400 years. After this, manv vessels left each year, brought back hundreds of slaves and added to geographical knowledge as the vessels went further down the coast to enslave the negroes.

Prince Henry died in 1460, soon after the discovery of Cape Verde and the outlying islands, and after this much quicker progress was made in sailing to the southward, so that in 1486 Bartholomew Diaz achieved the great feat of sailing round South Africa to Algoa Bay, although he was sailing so far from the coast that it was not until he was returning from Algoa Bay that he discovered the Cape of Storms and recognised that he at length had found the southern limit of Africa. During this same year, 1486, another Portuguese explorer, Covilham, sailed in an Arab vessel from the Red Sea down the east coast of Africa as far as Sofala, abreast of Madagascar, which island had been known for many years to the Arabs (but Diego Diaz was the first European to land there in 1500). Although King John was delighted with the discovery of the Cape of Storms and changed its name to Cape of Good Hope, yet it was not until 11 years later, 1497, that he sent an expedition under Vasco da Gama to sail round the Cape to India. Da Gama named Cape Agulhas because he found that in that vicinity the compass needle pointed true north, there being no variation, and he named Natal, as he was there on Christmas Day. Continuing to the northward along the east coast, he came to Sofala, and thus the circumnavigation of Africa was completed and a way to India was found just before the dawn of the 16th century, for Da Gama continued sailing up the coast until he obtained an Arab pilot (at Melindi), who directed him across to Calicut near the south end of India. He was thus the first to sail from Europe to India, and laid the foundation of the vast Portuguese trade with the East.

A few months after his return another fleet was sent out to India under command of Cabral, who discovered Brazil and took possession of it for Portugal, and commenced trade with India. In 1502 Da Gama was sent out with more ships. On arrival at Calicut he behaved with such atrocious cruelty to the natives that he stamped himself as being one of the most inhuman monsters who ever sailed on salt water. The Portuguese were now firmly established in India, and under the brave, humane Albuquerque and d'Abreu extended their possessions to Ormuz in Persia, and to Malacca and the Spice islands or the Moluccas in the East Indies, so that by 1520 they had the monopoly of the East Indian trade, which they kept for nearly 100 years, and geographical knowledge of the Indian Ocean from African shores to the East Indies made rapid progress, as is shown in the maps of the 16th century. But they had practically no knowledge of the southern coasts of Java and Sumatra, and Mercator's mythical great southern continent, with fanciful designs, extended from there to the south pole.

Whilst the Portuguese were creeping along the coasts of Africa to find a way to the Indies other men were thinking as to whether it was not possible to find a way to Cathay (China) by sailing westward across the Atlantic, and, after 1470, Columbus devoted all his energy in trying to get various sovereigns to give him command of an expedition to accomplish that object. He was strongly supported by a great Italian astronomer, Toscanelli, who drew a map of the world showing that Cathay and the East Indies could be reached by this route, which map he gave to Columbus. Unfortunately no copies of his map have survived, but attempts have been made by several cartographers of recent years to reconstruct it from contemporary references to it. Both Columbus and Toscanelli reckoned the distance from Europe to Cathay as being about 2,500 miles.

which is rather a curious coincidence with the actual distance from Europe to America, which is roughly 3,000 miles.

At length, in 1492, Columbus was despatched with two small vessels by Ferdinand and Isabella of Spain. He sailed southwards to the Canaries, where he had to refit the crazy, badly-found vessels which he had the honour to command. From the Canaries he sailed westward for nearly five weeks, and arrived at a very small island, probably one of the Bahamas, but which one is not definitely known. He cruised amongst the Bahamas and along the coasts of Cuba and Hayti, then returned to Spain confident that the islands discovered were near Cipanga (Japan), and that Cuba was portion of China, his view being accepted by the cartographers, who placed discoveries in that position on their maps under the name of the Indies, and it was not until 25 years after his death that they were distinguished from the Asiatic Indies and named the West Indies. Columbus had left a small number to form a colony to collect the gold and spices of the East, which he had not seen but felt sure they would soon find. From now on more islands were discovered. The Cabots, in 1497, sailed from Bristol and discovered Newfoundland, and sailed down Nova Scotia and maybe further. Columbus, in 1498, sighted Trinidad and a small portion of South America. All these discoveries were placed on the maps as still more islands off the coast of Asia, but La Cosa's map of 1500 also sketches in a continuous outline, which may be intended for the American continent. Several names are connected with discovery of sections of Brazil about this time, the most prominent of them being Americus Vespucius (his Latinised name), who made three voyages along the northern coast of South America, possibly as pilot or navigator, of which we have only unsatisfactory accounts, and then in 1501-2 sailed along Brazil, perhaps as far as the Rio de la Plata, Americus then being the chief in command. A storm drove them further south, probably to South Georgia Island, where they decided to return to Spain. On his arrival there he stated that he had discovered a New World. At once the phrase "caught on"; all recognised that Columbus had discovered many islands, but Vespucius had discovered a New World. Columbus accepted the statement, and died four years later, still believing it; and cartographers placed a big lump of land called Mundus Novus off the east coast of Asia in addition to the many islands already there. A few years later, in 1507, the well-known cartographer Waldseemuller proposed to call the eastern portion of Mundus Novus America, and maps were published accordingly; but shortly afterwards the word America was stretched across all of Mundus Novus, so that it became the name of the southern part of the New World, as is shown in da Vinci's map of 1514. In 1513, Balbao crossed the isthmus of Panama or Darien and named the water on the other side of it the South Sea, as it lay to the southward of him. Still, men believed that only a short distance further than he could see across this South Sea was the country of Cathay with all its riches.

Now, during the life of Prince Henry, the Pope (Eugenius IV.) granted to Portugal all heathen lands that might be discovered beyond Cape Bojador to the Indies; so directly Columbus arrived with news of his discoveries Ferdinand also sent an embassy to the Pope, Alexander VI., requesting a similar grant to Spain of all lands to be discovered in the Western Ocean, which was at once granted, hence the famous so-called "Pope's line" of demarcation, whereby taking a meridian 100 leagues to the west of the Azores and Cape Verde isles, all lands to the east were to belong solely to the Portuguese, and to the west belonged to the Spaniards. This caused endless discussion, for none knew exactly where the Azores and Cape Verde Isles were; they were not in a north and south line with one another, and both countries reckoned a different length to a league. Therefore, next year, 1494, the Treaty of Tordesillas was signed by the two countries making the line of demarcation pass at a distance of 370 leagues west from Cape Verde isles, and this was the line which was rigidly adhered to by those two countries and by none other, although to the Spaniards' utter disgust it was found that it gave Portugal a portion of Brazil. From this treaty it followed that Spaniards could only sail to the Indies west about across the Atlantic, and owing to their recent discoveries geographers about 1515 were beginning to believe that there was a continuous continent, of which America was the southern portion, blocking their way. Consequently it occurred to Magellan that it was necessary to sail around the south end of America in order to get to the Indies, and for years he tried to get his own country, Portugal, to give him command of an expedition to carry out his intentions, and then finally offered his services to Spain. By this time, as has been mentioned, the Portuguese were established in the East Indies and gaining untold wealth through bringing spices to Europe; so to Spain Magellan pointed out that probably the opposite meridian to the line of demarcation passed through the East Indies, so as to bring the most valuable of the spice islands into Spanish possession. No one really had the remotest idea where this line of demarcation lay, and Magellan persuaded the Spanish Court that he would be able to prove that the Spice Islands rightly belonged to them; and, of course, they believed that it was only a short distance of some few hundred miles to sail from America to China, instead of the 10,000 which it really was. They gave him command of an expedition, which left Spain in 1519 to make the wonderful voyage of discovery and adventure, the survivors of which, under Del Cano, became the first to circumnavigate the world. It seems probable that it was already known that there was a strait south of America, as on Schoner's globes of 1515 and 1520 a strait is shown separating America from a large lump of land. Magellan sailed through the strait in 1520 and across the Ocean, which he named Pacific, arriving three and a half months later at the Ladrones, which name he gave to them, and 10 days later reached the Philippines, where they were the first Europeans to land, and where he was killed. He thus proved the existence of the great Pacific Ocean lying between Asia and America, so that geographers and cartographers had to make large alterations on their maps, which were now drawn with Asia connected to a large continent where the North Pacific Ocean lies, and placing South America and the West Indies in their approximately correct positions. But Ponce de Leon having discovered Florida, Cortes conquered Mexico, the Spanish reached the North Pacific Ocean, and sent small expeditions along the coast, both northward and southward. Pizarro conquered Peru, and Chili was taken soon after, so that a large portion of the western coast became known, and in 1541 Mercator published a map on which he shows the continent of America separated from Asia, and on which he divides the word America into two parts, AME being on the northern continent and RICA on the southern; thus this name, which rightly belonged only to a thousand miles of the east coast of South America, became the name of two large continents, for it was only a matter of time for the divisions North and South to be prefixed. On this map also Mercator sketched the outlines of an imaginary vast continent extending round the world throughout the Southern Ocean, which caused such endless discussion for 200 years, until it was finally disposed of by Cook in 1773-4, and was then removed from all maps.

Cortes also despatched a vessel under Saavedra to sail to the westward to the East Indies in 1528. He arrived there safely, but on his return was unable to sail to the eastward against the trade winds. He returned to the Spice Islands, tried again to sail eastwards and died. His crew again returned to the Spice Islands, and eventually the Portuguese returned them to Lisbon. Villalabos annexed and named the Philippines in 1543, and for two hundred years a regular trade was carried on between Acalpulco and Callao and Manila, this being the Spanish route to the East Indies from Spain to Isthmus of Panama, then overland to the Pacific to their west sailing galleons. One of his captains, Ortez de Retez coasted several hundred miles along the north coast of New Guinea, which name he gave to it. The famous navigator Monk Urdancta, about 1560, had solved the difficulty of the return voyage to New Spain by writing sailing directions directing vessels to sail N.E. and north after leaving the Philippines, until they were in 35° or 40° north latitude, then with west wind to sail east until they made the American coast. This became the recognised trade route. In 1567 Mendana sailed westward from Callao and discovered and named the Solomon Islands, but as was usual in those days, ascertained their position so roughly that they were not found again for 200 years. This was the first attempt to find either a mythical Eldorado or the great southern continent in the Pacific. They returned to Mexico, and the Spaniards thought little of their discovery of their Land of Ophir, or Solomon Isles.

Not until 1595, nearly 30 years later, could Mendana persuade Spain to send him again to found a colony on the Solomons. With him as chief pilot was Quiros, a Portuguese, the last of those great old Spanish-Portuguese navigators. They discovered the Marquesas Islands, could not find the Solomons, but found the Santa Cruz group, where Mendana died, and Quiros brought the survivors to Manila and back to Acapulco, in Mexico. Ten years later, in 1605, Quiros was again sent to find southern islands and lands, with three vessels, Torres being in command of the second largest. They sailed south-west to 26°, then to the north-west for Santa Cruz, but found the New Hebrides group instead. Here his crew mutinied and forced Quiros to return to New Spain, but Torres continued to carry out their instructions with the other two vessels. He sailed south-west to latitude 20° without finding the great south land, then sailed northward, intending to pass east of New Guinea, then on to Manila; but his course brought him further west than what he expected, and, being unable to beat round the eastern extremity of New Guinea, he sailed closely along its southern shores, until he finally reached its west coast and was then able to sail northwards to the Moluccas and to Manila, where he died apparently a few years later. Torres thus discovered the south coast of New Guinea, and sailed through Torres Strait, not knowing it was a strait with a large continent on its southern side. He believed that he was only sailing amongst a number of islands, reefs and shoals, and most probably did not see any part of Australia even in the far distance.

Thus ended the last of the famous old voyages of the Spanish and Portuguese navigators, which had added so very much to geographical knowledge.

In 1577 Sir Francis Drake was sent out on a voyage to the Pacific. After passing through Magellan Strait he was blown to the south of Tierra del Fuego and named Elizabeth Island, which was later on named Cape Horn, and thus proved that Mercator's southern continent did not extend to that point. He then sailed up the coast of America, charting it with rough accuracy so that other vessels might follow in his track, until he reached Cape Mendocino in lat. 40° N.; then he refitted at or close to San Francisco, then sailed across the Pacific, through the East Indies, across the Indian Ocean to England, thus being the first captain to circumnavigate the world in command of his vessel throughout the entire voyage. A few years later Thomas Cavendish, in 1586-88 made almost a duplicate voyage of Drake's thus being the third circumnavigator.

During 1550 to 1600 Englishmen determined to find a way to China through the Arctic regions, either to the north-west, north of America or to the north-east, north of Asia. In very small, badly-found vessels, quite unprepared to withstand ice and cold, they attempted to perform the impossible, for no practicable passage does exist. They each added to geographical knowledge, and many died in doing so. In search of the north-west passage were the Elizabethan seamen Frobisher, and the greatest navigator of all John Davis, Sir Humphrey Gilbert, and a few years later the fearless Henry Hudson, who perished there during his fourth voyage; Button, Baffin and Bylot, whose names are all perpetuated on charts of the Arctic Seas. In search of the north-east passage were Sir John Willoughby, frozen to death with crews of two vessels in the White Sea; Chancellor, who survived and went overland to Moscow; and Barentz, a Dutchman, who died on Nova Zembla.

During the latter part of the sixteenth century the attention of English and Dutch was drawn to the East Indies owing to the reports of Drake and Cavendish, and by the publication of that wonderful book of geographical knowledge and maps, Linschoten's "Voyage to the East Indies." Linschoten was a most observant Dutchman, who had spent some years in the Indies, and in 1595 published his book, which had tremendous effect in both Holland and England. Most fascinating is the history of these two countries in the East during succeeding years, but this evening we are only concerned with the geographical aspect. The small East India company of a few English merchants had perforce to confine their operations principally to India; not for nearly a hundred years did they become that powerful company of whom we have read so much with pride. In 1591 their first ships into Indian waters were commanded by Capt. Lancaster, and in the sixteenth century their sea captains, specially Davis, charted with considerable accuracy the coast lines from Africa to Singapore, and thus added to geographical knowledge. But with the Dutch it was very different. They had recently thrown off the Spanish yoke and hated Spain. In 1580 Spain had annexed Portugal. Therefore, in the seventeenth century the Dutch sent numerous very powerful fleets to the East Indies and drove out both Portuguese and Spanish, and practically created a Dutch monopoly amongst the islands.

In 1600 a ship commanded by van Noort sailed westward across the Pacific to the East Indies, returning by South Africa, thus being the first Dutch circumnavigator; and another under de Wert sailed across to Japan, adding much to geographical knowledge, and in 1615 Spilbergen, with several vessels, sailed up the west coast of South America and across to the Philippines on much the same track as Cavendish had made. Next year Schouten and Le Maire sailed south of America and named Cape Horn (after the Dutch port from which they had sailed), and in sailing across the Pacific discovered and named Horne Islands, and saw New Ireland, Admiralty Isles and North-east New Guinea. On their return to Holland very useful accounts of their voyage were published. All the rest of the Dutch expeditions sailed across the Indian Ocean, the first fleet in 1595 being commanded by Houtman.

In 1605 the Dutch, being then strongly established in the East Indies, sent a small vessel commanded by Jansz from Bantam, in Java, to explore the south coast of New Guinea. They sailed along part of it, and then across Torres Strait into the Gulf of Carpentaria, along the shore of Cape York Peninsula to 13¾° south latitude, and this is our first authentic account of the discovery of Australia. Jansz was there about March, 1606, and Torres sailed through the strait in September, 1606.

In 1611 the Commodore of the Dutch Fleet, named Brouwer, initiated a different route for sailing from South Africa to the East Indies by keeping an easterly track (after leaving the Cape) for 4,000 miles, thus making use of the prevalent westerly winds "in the Roaring Forties," and then hauling up to the northward for Java. By so doing he made a much quicker passage, and the route was adopted by the Dutch East-Indiamen. This quite naturally led to the discovery of the west coast of Australia, for numbers of vessels overran the 4,000 miles and sighted various portions of the coast. The first we know of who discovered the west coast was Dirk Hartog in 1616; others in succeeding years have left their names on our maps, such as de Witte, Edel, Nuyts and ships' names as "Eendragt," "Turtel Duyf," "Leeuwin," and these portions pieced together gave geographers a fair idea of the outline of the west coast; and the ship in which Nuyts was a passenger also sailed along the south coast in 1627 to the head of the Bight.

In 1623 Carstenz was sent from Batavia and sailed along the south coast of New Guinea, but found no way through the reefs of Torres Strait, which he described as a shallow bight. He sailed across, as Jansz had done, and went further down the Gulf of Carpentaria, believing that Cape York Peninsula was part of New Guinea. His companion vessel separated from him and sighted Arnhem's Land as she returned. In 1642 the Governor-General, Van Diemen, gave Tasman a golden opportunity to make discoveries, but he proved himself to be a poor sort of explorer. Leaving Batavia, he sailed to Mauritius; he then sailed eastward looking for the southern continent. but he went no further south than 49°, thus seeing nothing of it. Instead of making for the south coast of New Holland, he sailed far from it in latitude 44° to 42° and thus discovered Tasmania. Instead of now steering north to find the east coast of New Holland, he continued sailing east and discovered New Zealand, which he assumed to be part of the unknown southern continent. He did not trouble to find out whether it was an island or not, nor would he attempt (as Cook did) to sail from New Zealand to the east coast of New Holland, but sailed northwards, discovered the Tonga group and a portion of Fiji, then sailed north-westward round New Ireland and north coast of New Guinea, as others had done before him, and thus returned to Batavia, to the small satisfaction of his tough, hard-headed employers, who certainly did not think that he had gained much geographical knowledge which was of use to them, for when he had the chance he had not even found out the south and east boundaries of New Holland, though he had proved that it was an island and that they could sail round it into the Pacific Ocean. However, in 1644, Tasman was again given command of an expedition to ascertain whether New Guinea was connected to New Holland, also if a channel existed from Gulf of Carpentaria to the sea south of New Holland. Tasman's account of the voyage is unknown, but a chart made by him shows his track across Torres Strait to the head of Gulf of Carpentaria, then across to Arnhem's Land round N.W. corner to the west coast, where he returned to Batavia, thus giving a fairly continuous outline of the continent from Cape York westward, then down west coast round the Leeuwin to head of the Bight, with imaginary lines connecting it to Tasmania. It is also stated on his chart that New Guinea and New Holland form one continent, which continued to be the general belief until Cook proved otherwise, 126 years later.

During the latter half of the 17th century Dampier was roaming about the world, chiefly in buccaneer vessels, writing more faithful descriptions of the parts he visited than any other man had done. He seems to have noticed everything, and his remarks on winds, currents, coast lines, countries and their inhabitants are wonderfully accurate. Up to the year 1760 no man had ever given such accurate geographical descriptions of so many countries and oceans as Dampier. He visited the west coast of New Holland in 1692 in the buccaneer ship "Cygnet"; and again, in 1699, in command of H.M.S. "Roebuck," and gave good descriptions of the country and inhabitants, then sailed around the west and north coasts of New Guinea. He found the strait which separates it from New Britain, or Nova Britannia, as he named it, the strait now being called Dampier Strait. He intended to sail down the east coast of New Holland, but his ship was too rotten, forcing him to return to England, and she foundered at Ascension Isle as he was homeward bound in 1701; as Dampier wrote, "she perished through perfect age."

Such is a brief outline of the discoveries made by the most prominent navigators, though many also assisted in a less degree. The names of some of the geographers and cartographers who patiently pieced together the various good and bad reports must also be mentioned, as they helped to build up our maps of to-day.

In 1400 the only atlas was the one originally produced by Ptolemy 1,200 years before, and so crude were the maps that they could have been of very little use, either by land or sea. But Italian cartographers had produced Portolanos or sea charts of the Mediterranean which were decidedly of some use to seamen. Between 1400 and 1600 something like a dozen editions of Ptolemy's atlas were issued by various cartographers, who entirely redrew the maps, bringing them up to date with new discoveries. Between 1550 and 1700 beautiful atlases were published in Holland by a long succession of great Dutch cartographers, such as the Mercators, Ortelius; Waggenar, who published his Sea Atlas in 1584 with sailing directions, so that for a hundred years after English seamen called charts and sailing directions "Waggoners." Then came Linschoten with his maps and descriptions. About 1600 Hondius was producing excellent maps, resident for several years in London, working in conjunction with Edward Wright, the great mathematician who gave to the world the explanation of what is called Mercator's projection, for Mercator had drawn one map on this projection but never published any. After Wright had published his treatise in 1598 all sea charts were drawn on this projection.

After Hondius came Plancius, the Goos, father and son, and Blaues, producing beautiful maps, also de Witt, Jansson and Visscher—a wonderful series of map publishers whose maps are a pleasure to look at on account of the high quality of the work put into them. Mention must also be made of the collection of voyages by De Brys published about 1600; and of Richard Hakluyt, who first compiled a list of English voyages, published in 1600, and followed 20 years later by Samuel Purchas, who added a large number to Hakluyt's collection. Geographers and the British nation owe a deep debt of gratitude to these two country parsons for their life work. All the above-mentioned atlases and publications are contained in the wonderful library of Mr. William Dixson, F.R.G.S., at Killara, in the study of which we have together spent many happy days during past years.

So geographical knowledge grew, bit by bit, in both right and wrong directions, men continually striving to produce better and more reliable results; irresistibly reminding one of our efforts of to-day, always striving to draw things "as they are," and always with that feeling expressed by Tennyson:

"But what am I?
An infant crying in the night,
An infant crying for the light,
And with no language but a cry."

The Geological Basis of Queensland Industry

By W. H. BRYAN, D.Sc.

(Lecturer in Geology, University of Queensland)

The industries of a country are dependent on many factors, and these factors are themselves often interdependent to a greater or less degree. While in some instances, one particular factor may be so overwhelmingly important as to amount virtually to a sole control, the others being at best mere modifying influences, such instances are by no means common, and are to be regarded as exceptions to the general rule. It follows that the study of the influence of one selected factor, such as the geological, on the many industries of Queensland, and the relative values of that factor in each of those industries, would be an exceedingly tedious and laborious undertaking, and would, moreover, require of the investigator far more than a working knowledge of the geology of the State. For these reasons the paper which follows does not pretend to be a balanced account in which the geological factor is always given its proper weight.

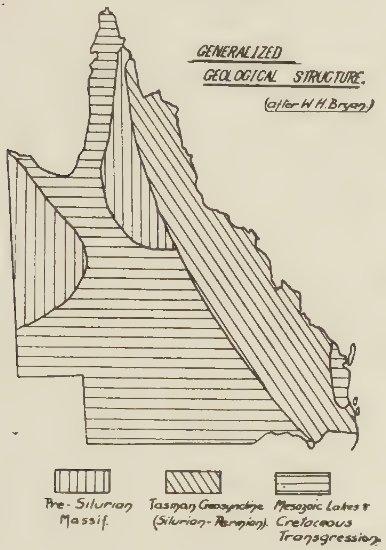
The first of the accompanying maps (Figure 1) is an attempt to represent in broadest outline the essential features of the geology of Queensland. It has not been prepared specially to illustrate this paper, and it is not concerned with any other than geological data. The geological structure of the State is not completely understood, and, where understood, is often complex in detail, so that the map is no more than a crude generalisation, but is, in my belief, fundamentally sound.

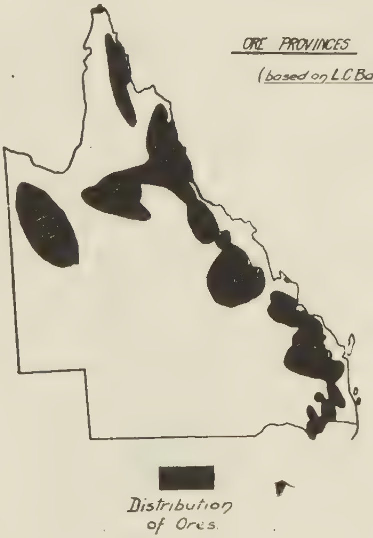
Reduced in this way to its simplest terms, Queensland may be considered as made up of five geological units, which fall naturally into three categories:

(1) The two Pre-Silurian complexes made up of very old and very resistant rocks.
(2) The Tasman Geosyncline, composed of old sediments ranging from Silurian to Permian age.
(3) The Mesozoic and younger sediments, which are for the most part comparatively soft and unresistant.

Postponing for the moment a more detailed consideration of the geological units, let us examine those industries which are based primarily on geological factors and whose distribution is, therefore, almost coincident with that of the geological formations.

A scrutiny of Figure 2, which is a map prepared to show the distribution of ores within the State, will show that the occurrence of these is far from haphazard. The distribution, as might be anticipated, is directly referable to the underlying geological formations. Thus, the minerals containing gold, silver, copper, tin, lead, molybdenum, tungsten and other valuable metals are never found in the Mesozoic and later rocks, but occur at numerous localities both in the Tasman geosyncline and in the Pre-Silurian complexes. On the other hand, the opal-fields are restricted to the Mesozoics. Turning to Figure 3, we see that coal is never found in the Pre-Silurian complexes, but is present in vast quantities in the Tasman geosyncline. Very little coal has been mined from the main area of Mesozoics, but, fortunately, the smaller area in South-eastern Queensland is exceptional in that it contains the valuable Ipswich, Walloon and Burrum coal-fields. All the limestones of any economic value are found within the Tasman geosyncline or in the Pre-Silurian regions.


GENERALIZED
GEOLOGICAL STRUCTURE.
(after W. H. Bryan.)
Pre-Silurian Massif.
Tasman Geosyncline (Silurian-Permian).
Mesozoic Lakes & Cretaceous Transgression.



It would be possible to cite many more facts illustrating the close relationship of our mining industries to the geological structure of the State, but such additional evidence would merely emphasise the obvious.

Let us next consider the part played by geological influences on the distribution of the natural vegetation of the State. An inspection of Figure 4, which is based on the map recently issued by Professor Prescott, shows that the forests are found for the most part in the Tasman geosyncline and the grasslands on the Mesozoics; but, while this arrangement is not accidental, it certainly is not due solely to the direct controlling influence exercised by the nature of the geological formation on the vegetation which it supports.

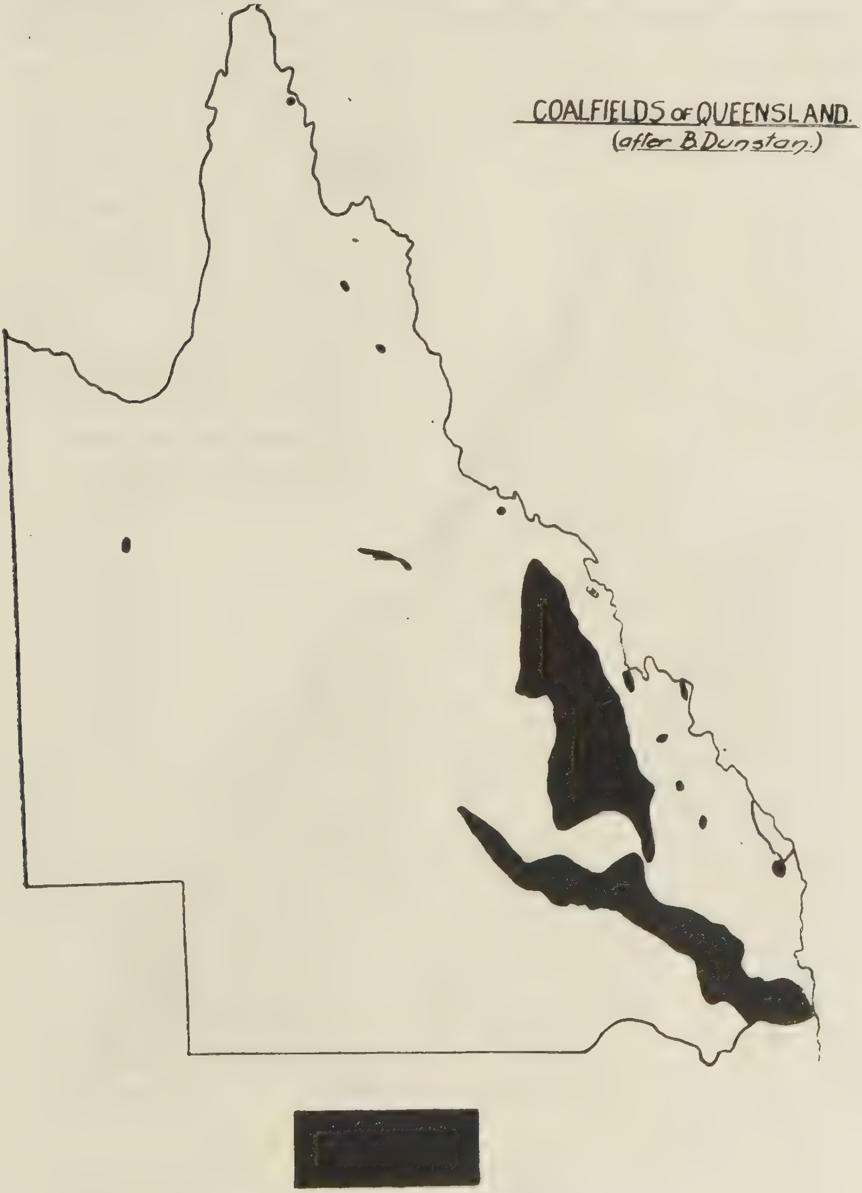
There are two factors which are most powerful in influencing the natural vegetation in Queensland as elsewhere. These are soil and climate. Of the two, it might be supposed that the former was largely controlled by the geological formation and the latter quite independent of such control; but neither supposition represents the complete truth.

It is popularly believed that all soils are virtually controlled by the nature of the underlying rocks whence they were derived. The facts of observation show that such a belief is quite incorrect. While it is quite true that some, the so-called "Skeletal Soils," are so like their parent rocks as to be really nothing more than disintegrated portions of them, and that other "Immature Soils" have much in common with the underlying rock, the fact remains that it is in many cases the climate which ultimately becomes the dominating factor, so that in the end, when the soil has reached equilibrium with its environment and attained maturity, it may not resemble, even remotely, the parent rock from which it sprang. This point is well illustrated if one compares a geological map of Europe with a soil map of Europe. The two have not the slightest resemblance. The geological map looks like a patch-work quilt, the soil map appears as several broad bands roughly parallel and concentric with the north pole, which significantly coincide almost exactly with well-marked climatic regions. In many other parts of the world where systematic soil surveys have been made on modern lines, the results have tended to minimise the relationship between soil types and parent rocks, so that in the present state of our ignorance, it certainly would not be safe to assume that the soil map of Queensland (Figure 5) owes its general resemblance to Figure 1 solely to direct geological control.

It is true that many of our basaltic soils within the Tasman geosyncline support dense forests, but it is equally true that in the Hughenden district (where large areas of basalt overlie the Mesozoics and where the climate is drier) they do not. On the other hand, although the sandy soils overlying the granites of Southern Queensland support but a poor forest growth, similar granitic soils under the heavy rainfalls of Northern Queensland are covered with luxuriant jungles. I know of only one large scale example in Queensland where the parent rock is undoubtedly the prevailing ecological factor. This example is provided by the formation known as the Bundamba Sandstone, which overlies a considerable area of the Tasman geosyncline. The sandstone is very siliceous, and the overlying soil is little more than quartz sand, which supports a meagre vegetation.

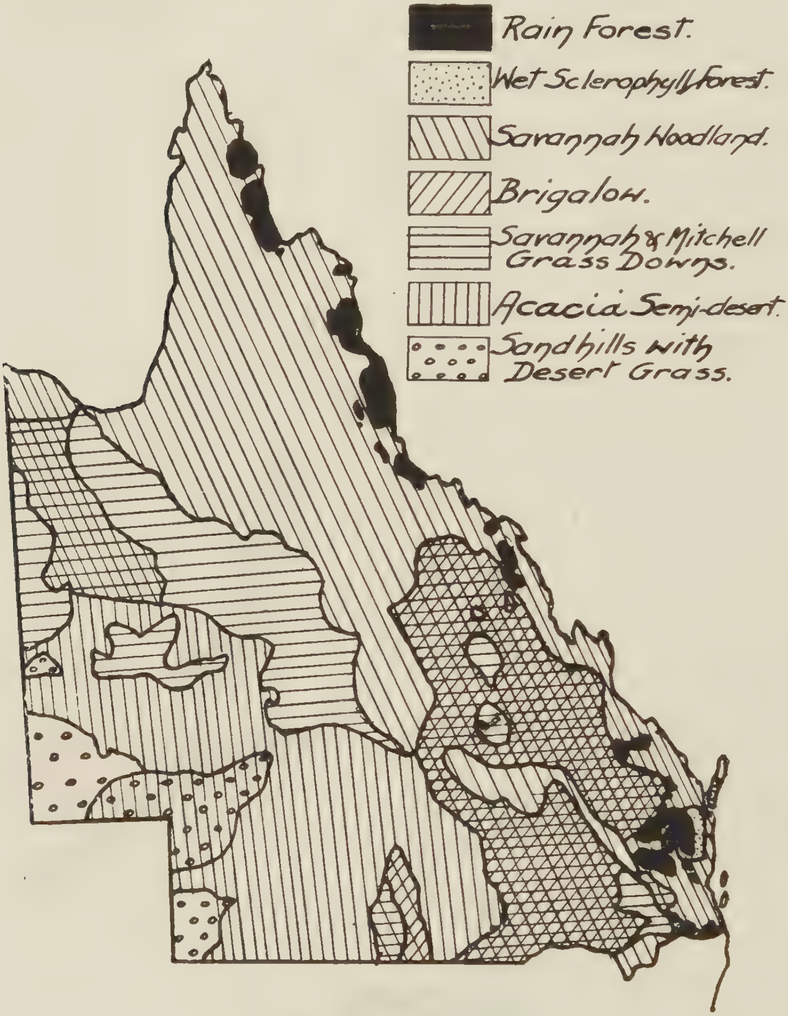
But, if the distribution of natural vegetation in the State cannot wholly be explained as the result of the influence of the several geological formations as exercised directly through the overlying soils, it may still be explained, although in less direct fashion, as ultimately due to the geological structure of the State.

If we compare Figure 1 with an orographical map of Queensland a certain general resemblance is apparent, for the more elevated portions of the State are situated in the regions of the Tasman geosyncline and the Pre-Silurian complexes. The explanation is that the older formations of the State, partly as a result of their superior hardness and partly as a result of their geological history, form the highlands of the State, while the softer Mesozoic and younger rocks form the rolling downs and lowlands.



Areas of Outcropping Coal Measures.

To proceed a step further, let us examine the map showing the climatic regions of Queensland (Figure 6), which has been copied directly from that of Griffith Taylor. Here again there is a noticeable similarity with our map showing the geological structure, the explanation being simply that while the geological structure controls the physiography, the latter in large part controls the distribution of rainfall.



VEGETATION.

(after J.A. Prescott.)

If we now return to the map showing the distribution of the natural vegetation, we see that it can be easily explained if we agree that climate is the all-important controlling factor.

The resemblance to the geological map may be only in small part and in restricted areas caused directly through the nature of the soil, the more general parallelism being due to the fact that, in Queensland, (1) Geological structure, (2) Physiography, (3) Climate, and (4) Natural Vegetation form an unusually dependent sequence.

Turning now to the Agricultural Industries, it will be clear that so far as the two factors soil and climate are concerned, the remarks made above with particular reference to the distribution of forests and grass lands will be applicable. Hence we should expect, if other conditions such as communications and proximity to markets permitted it, that the area devoted to agriculture would, like the natural forests, be found in the Tasman geosyncline. Thus the only map which I have found in which an attempt has been made to mark the boundary line between those parts of the State concerned respectively with the agricultural and pastoral industries places that line almost coincident with our western boundary of the Tasman geosyncline, except in the extreme south, where the industrial boundary sweeps further to the west.

A closer inquiry will show that the more detailed distribution of the agricultural industries is in part connected with the occurrence of rich basaltic plateaux, such as those of Atherton and the Darling Downs, and in part with the extensive terraces of deep alluvium which represent the pre-historic flood-plains of the present streams. As the arrangement of these streams is, in my opinion, to be a vital factor in the further development of Queensland agricultural industries, it will be relevant to consider their relationship to the geological structure of the State.

The strata which occupy the Tasman geosyncline have, since their deposition, been strongly folded along axes running in a north-north-west direction. The removal long since of the arches of these folds has exposed the edges of steeply-dipping strata. These, comprising as they do rocks of many ages and of many types, were not uniform in their capacity to resist the weathering agencies, hence, as a result of selective erosion, the softer formations were worn away to form valleys and the harder remained as ridges. Both valleys and ridges would thus follow the general direction of strike which, in its turn, was determined by the direction of the axes of folding; in other words, the geographical orientation of the rivers will directly reflect the geological grain of the Tasman geosyncline. This grain or structural trend is diagrammatically shown on Figure 1 by a series of parallel lines drawn from S.S.E. to N.N.W. The effect of this pronounced strike on the drainage of the State was to cause the rivers in that part of Queensland to be streams of "subsequent" type, with their principal valleys and longer reaches in a N.N.W. direction. This meant that instead of flowing directly towards the coast by the shortest route, they flow for a large part of their course parallel to that coast. One result of such an arrangement is that the gradient of the streams is usually very gentle, except where they break through the ridges from one valley to another. At these points the streams quicken, and there are often rapids. When we add that (as a result of a recent rejuvenation of our stream systems) there are in the longer reaches wide plains of alluvium now above flood level, it will be realised that there are present in our eastern stream system all the more important requirements for irrigation on a large scale. One such enormous irrigation scheme has been initiated in the Dawson Valley.

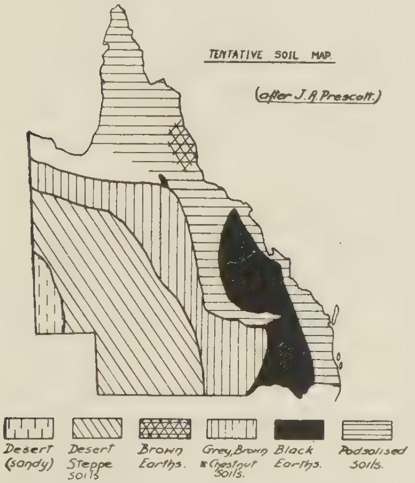
Let us now consider the pastoral industries. Since the principal controlling factors of these industries are climate and natural vegetation, one cannot at first see how the geological structure of the State could play any important part in the distribution of sheep and cattle. But I have attempted to show that both climatic regions and natural vegetation are ultimately controlled by the geological factor, hence it is not surprising that the distribution of sheep in Queensland, as shown by the Commonwealth Year Book, is roughly coincident with the principal area of our Mesozoic and later sediments. (The map for cattle shows no relationship whatever to our geological map, but this is not surprising since there has been, strangely enough, no differentiation in the official map of the beef from the dairying industries.)

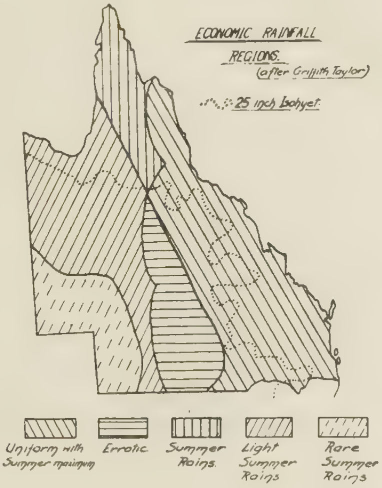
The geological structure of the great pastoral area is in striking contrast with that of the agricultural region, and, in consequence so is the geography. The main area of Mesozoic sediments is made up of gently dipping strata. They have not been folded, hence there is no pronounced geological grain. Their edges have not been exposed; therefore, there has been no opportunity for the work of selective erosion. The absence of any marked geological trend is reflected in the lack of any pronounced geological orientation. The wide western plains overlying this wonderfully uniform structure are watered by a perfectly normal "consequent" system of rivers, which, whether they are tributaries of the Darling or flow into the Gulf of Carpentaria or are lost in Central Australia, have certain features in common. They are equally and uniformly spaced, and flow in almost direct lines from their sources to their several destinations.

In a pastoral country of low rainfall and high evaporation such a distribution of the available rain-water is almost ideal. Fortunately, too, this is supplemented by the enormous quantity of artesian water which can be obtained by boring in almost any part of the great area of Mesozoic rocks.

Two interesting but minor examples of the influence of geological structure on the pastoral industry may be noted here. The first is the fact that certain deficiency diseases in Queensland stock appear to be related to the geological formation over which the stock are grazing. Investigations which are now in progress may show a nice correlation between the contents of the stomachs of sheep and the mineral content of the underlying rock. The second example is found in southernmost Queensland, where the sheep on the palaeozoic rocks between Warwick and Stanthorpe grow exceedingly good wool, but will not breed satisfactorily, with the result that lambs have to be imported from the country of the mesozoic rocks a few miles further west. The explanation is simply that the palaeozoic rocks are hard and resistant, and produce rugged country unsuitable for the breeding ewes.

In the matter of the several secondary industries of Queensland this paper can concern itself only with the sources of power and the distribution of some of the raw materials. The chief source of power in Queensland is coal, of which there are enormous quantities. Indeed, there are few places in the world to vie with eastern Queensland in this respect. The distribution is not ideal, but it might be very much worse. Of the principal cities of the State, one only (Ipswich) owes its growth directly to the proximity of coal, yet most of them are conveniently situated with respect to coalfields, and this applies from Cooktown in the north to Warwick in the south. Practically every port, too, has a coalfield in its hinterland.





Unfortunately, some of the larger fields containing the higher grade coals are as yet not very accessible to the present centres of manufacture, and the suggestion has been made that these should be used on the fields themselves for the production of electrical power, which would be distributed by land lines.

Associated with the vast coal resources of the Tasman geosyncline, although not always as closely as one might wish, there are large quantities of ores (including iron ore), limestone and clay, and it is reasonable to believe that more detailed geological surveys will discover further deposits and perhaps more convenient associations.

The Pre-Silurian complex in the Cloncurry region is less favourably situated with regard to the smelting and other industries based upon mining, although vast quantities of ore have been proved. Thus Mt. Isa silver-lead mines will have to draw their coal 750 miles from Collinsville, while Mount Morgan obtained its coal from Baralaba, only about 60 miles away.

In the principal Mesozoic area coal has been obtained in relatively small quantities to the north of Roma, and it has been met with at considerable depths in artesian bores, but the possibility of a quite independent supply of power in this region is shown in the gas-wells in Roma itself.

The use of hydro-electric power for the secondary industries has often been suggested, but the only rivers suitable for power production on a reasonably large scale are the Barron and the Tully, both in the neighbourhood of Cairns, which at present relies for its power on coal from Mount Mulligan. It is possible, however, that should the extensive irrigation works hinted at earlier in the paper be developed, power schemes on a smaller scale might be associated with them, as has been done very successfully in Northern Arizona.

Finally, a few words may be said on the relationship of the railway systems to the geological structure of the State. The line linking Brisbane and Cairns has taken every advantage of the coastal plain which fringes Queensland for the greater part of the distance, and where it leaves this plain it makes use of natural corridors stretching in a north-north-west direction, the relationship of which to the underlying geological structure has already been considered. As a result of the use of these two structures, the railway line, seldom in its journey of over 1,000 miles is more than 200 above sea-level, and only in the Gympie section is it over 300 feet. An interesting illustration of the influence of geology in respect of the construction of railways is seen in the recently completed Mount Isa line. The object of this railway was to connect Cloncurry with Mt. Isa, which lies almost due west. The Pre-Silurian complex in that region has a pronounced north-south grain, with the result that the topographic features also have this direction, and thus oppose the westerly extension of that straight line of railway which stretches in an almost direct line over the Mesozoic plains from Hughenden to Cloncurry. Consequently it was considered necessary to abandon the direct route and to build the railway in a north-westerly direction from Duchess, which is itself 68 miles south-west of Cloncurry.

In conclusion, if a confessed geologist will be forgiven for his invasion of the province of the geographer, I should, greatly daring, venture the following predictions:

The two Pre-Silurian complexes have been devoted primarily to mining in the past, but with the depletion of the ore bodies these areas will be given over to cattle grazing.

The Tasman geosyncline is for the most part suited to forestry, agriculture, mining and manufacture. Mining for the more valuable ores will steadily decrease, but the winning of coal, iron, limestone and clay will gradually grow to very great proportions. The agricultural yield will be largely increased as the result of more intensive methods following extensive irrigation. The principal ports will become great manufacturing centres dealing with the raw products, iron, limestone, clay, meat, hides and (now that factories are able to control their own atmospheric conditions) wool and cotton.

The great Mesozoic plains will continue to support large pastoral industries, but, as a result of improved methods of dry farming, agriculture will gradually encroach on the eastern limits of the pastoral area.

China and the Future

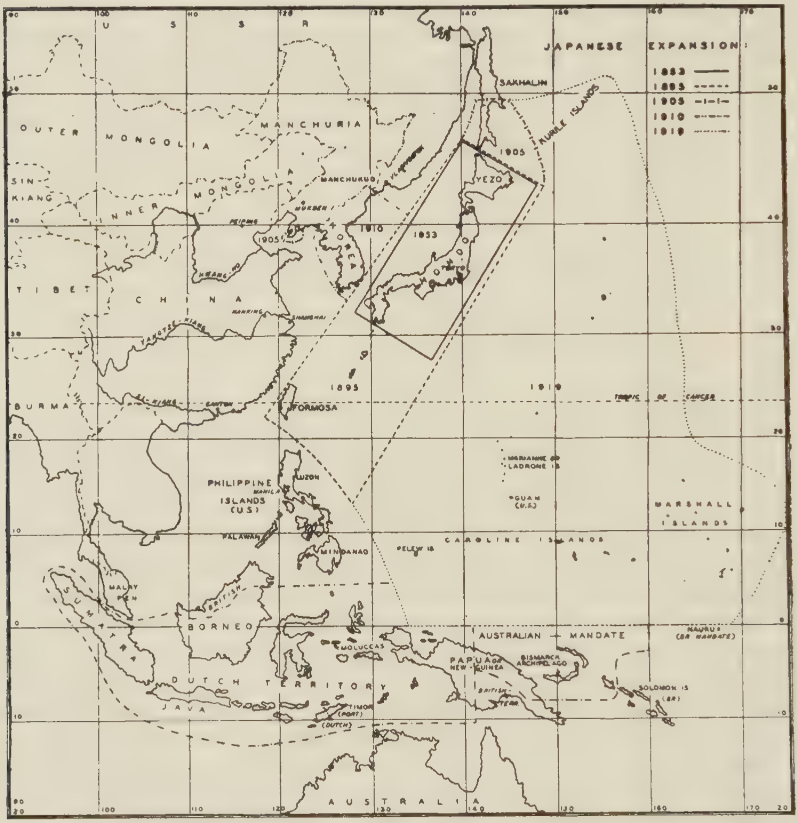
By MACDONALD HOLMES

Controversy between nations springs from diverse view points towards the interests of their nationals engaged in trade and commerce and the general competition of winning a livelihood. These interests are often diametrically opposite and then serious international as well as local friction may occur. More often phenomena are of mutual interest and with goodwill adjustments may easily take place. In both cases a full understanding of the facts of the issue makes for better understanding between peoples, and for China this is immensely significant.

While it may be thought that many of the problems are only to be solved by the Chinese and the British or Japanese resident in the disturbed parts of China, it is clear that great nations foreign to China view the problems as of such magnitude that decisions have to be made by their peoples as a whole. So rapid is the movement of events and so uncertain the news and so great the complexity of Chinese affairs that few, if any, dare say what current events may mean.

China is a land on the eastern coast of Asia over four million square miles in extent. It is thus one and one-third times the size of Australia. China proper, consisting of some 21 provinces, is the main part of China and has an area about half that of Australia. Modern developments and the main episodes in the history of the Chinese people are concerned principally with China proper. On the landward margin of China proper are six main kingdoms. (Map.) On the north is Manchuria and Hei Lung Kiang, on the north-west Mongolia (Inner and Outer), on the west Sinkiang and Tibet. To the south are the Malaya countries which have no direct connection with China. To the east of China proper lies the kingdom of Japan with its colonies of Korea, on the Asiatic mainland, and the large island of Formosa in the south. These western marginal kingdoms have always been reckoned as buffer states between the continental Asiatic peoples, such as the Russians, and China proper.

Whether the three semi-independent territories of Tibet, Mongolia, and Turkestan shall be considered as parts of China is a question open to debate. All are represented on the Chinese flag and are nominally parts of China. All are quite remote, with slight and infrequent communication and with indefinite political connection. Mongolia and Turkestan are largely under Russian influence with Russian control over Outer Mongolia now unchallenged In fact, Outer Mongolia has declared its independence and maintains a Soviet government.



It is probable that the total population of all this large area is in the neighbourhood of 440 millions* and the visitor to

---

* Elaboration of an illustrated lecture delivered to the Society on April 12, 1932.

China is impressed by the enormous numbers of people that he meets everywhere. The first and last impressions that one gets of China are those of multitudes of people. This enormous number of people represents one-fifth of the population of the world, and since it is not evenly distributed there is enormous density in certain large areas, which is why floods are so disastrous to China.

The most profound differences in China, in the matter of scenic appearance, climatic characteristics, the foods the people produce, their general activities and the dialects in speech are between what has been called North China, Middle China and South China.

North China is the region of the Hwang Ho River and the neighbouring plain and has its capital at Peiping (Peking). In many ways this region is so far north as to be somewhat isolated. Middle China, however, formed by the basin of the Yangtse with its capital, also the Capital of China, at Nanking, and its commercial centre at Shanghai, is in common language often called the north. South China, which is principally the basin of the West River, has Canton as the Chinese capital and Hong Kong as the commercial centre. At the present time the greatest political disunity occurs between the northern and middle regions and the south.

The greatest conflict at present in China is between the centralised government which claims to administer the whole of China from Nanking and the other forceful groups which are chiefly in the south at Canton.

In spite of all this large area and this great number of peoples most that is written about China in current periodicals and the press concerns the turmoil of affairs that occurs in and around some four or five city regions, namely Canton, Nanking, Shanghai, Peiping, and Mukden in Manchuria. What is happening in the vast remainder is practically unknown.

Controversy in China then takes two aspects. Firstly there are internal conflicts, military masquerades and development problems in transport and in education. Secondly there are international conflicts, and while these are of least importance they take first place in international affairs and in our general appreciation of things Chinese. International conflicts take place on Chinese territory because the Great World Powers have colonies there. These colonies are not of the usual type and are spoken of as concessions and settlements. The territorial limits to which the power of these colonies extends over China are called "spheres of influence" when political, and "spheres of interest" when purely economic. It is not possible, however, in China to separate political and economic affairs, so that issues are often very complex.

---

* China Year Book, 1931.

The concessions and treaty ports in China, which until recently were about fifty in number, are mostly near the coast. These regions do not come under Chinese laws, but are under the laws of the respective Powers. In some cases, as in Shanghai, the areas are international in character, with a number of Powers holding concessions, which thus gives their nationals the right to own land and live in China practically as they would in Britain, or the United States. These concession areas are as modern as our cities and ports in Europe and America, while China as a whole is comparable to 17th century Europe. The modernisation, so called, of China and the change from a literary and agricultural system to industrialisation of the Western type, is taking place through the treaty ports and therefore controlled by foreign Powers. Much of the grievance of those who claim to speak for China lies in the fact that the modernisation of China is, therefore, not under Chinese control and much of it is not to their liking. Nevertheless these concessions are necessary as temporary evils if China is to have any foreign trade.

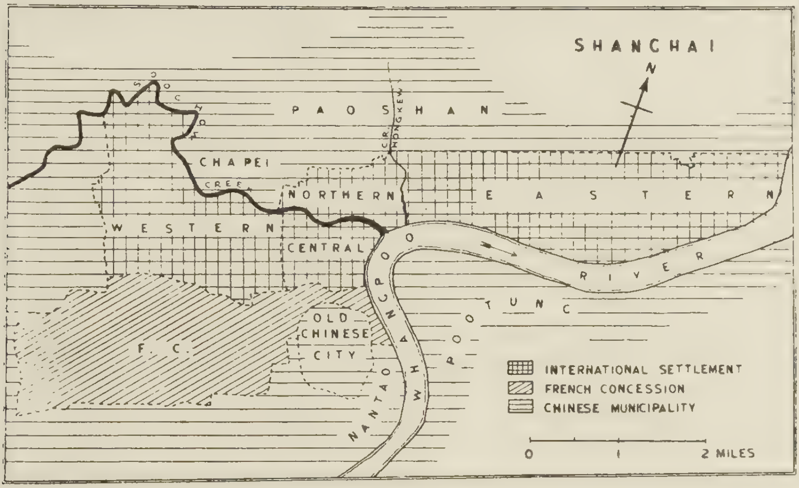
In the interior and west of China foreign influences from one Great Power, namely Russia, have made themselves so felt that regions like Mongolia have allied themselves to the Union of Soviet States. Therefore China at the present time is in continuous conflict on her own territory with Powers which are foreign to her.

The magnitude of foreign interests on the coasts of China can be measured from a description of Shanghai:—

Greater Shanghai is the most important port in the east of Asia and from its shipping tonnage the fifth in the world. It contains more than 30,000 foreigners and over one million Chinese, and is probably the financial, commercial, and industrial centre of China. The pre-eminence of Shanghai is due for the most part to its geogaphical situation. In the delta of the Yangtse there is an area of 50,000 square miles (about one-sixth of New South Wales) which supports 40 million people, and all these are directly interested in Shanghai. The whole catchment area of the Yangtse River system is about two and one-half times the area of New South Wales and supports a population of 180 millions or about one-tenth of the inhabitants of the whole world. It can be said also that the most important half of all China is served by the port of Shanghai. Shanghai consists of an old city dating from the 11th century, an international city and a French concession, and a number of marginal suburbs. To the north is the Chinese industrial suburb of Chapei, to the east Pootung and to the south Nantou. The total area of Greater Shanghai is about 17 square miles.

The British, the Americans and the Japanese are the three Powers principally concerned in the International Settlement. The French region is a separate unit. Originally these settlements were meant for foreign nationals, but at the present time the great majority of the people are Chinese, and in great part these peoples share in the benefits of the settlement and have a say in its administration. The whole region of Greater Shanghai involves close co-operation between foreign Powers and the Chinese authorities. In the industrial development of Shanghai the significance of the Chinese is shown by the fact that half the net trade of the port is concerned with things produced by Chinese.

Events more rapidly in parts of the East these days, but a general conspectus of affairs in each of the disturbed regions is a very necessary preliminary to further discussion of Chinese controversial issues. Manchuria, which is an autonomous kingdom, is said to contain over 30 million Chinese and a few thousand Japanese citizens, the majority of whom are Koreans; it is an extensive plain area as large as New South Wales, stretching north and south and surrounded by mountains. It has always been considered by the Chinese as its three northern provinces, and the Manchus ruled China for three hundred years. It is a region immensely rich in coal and iron in the south and in soya bean and agricultural produce further north.



There are three nations which concern themselves with Manchuria—the Chinese as regards their 30 million people, the Japanese with their treaty concessions and extensive railways and their trade development, and the Russians in the north with their railways and trade development. For the present moment the Russians lie dormant, the Chinese are "over-run" by military overlords and bandits, so much so that the Japanese find it difficult to carry on their railways, principally the South Manchurian railway, and have instituted a protectorate independent of China called Manchukuo—a new state in central Manchuria—and have exceeded all treaty rights, though not necessarily their trading interests.

It should be noted that in Manchuria the Chinese are immigrant farmers perpetuating the ancient regime of Chinese agriculture and in general not sufficiently organised to withstand excessive taxation and spoilation by Chinese Government officials and war lords. The "raison d'etre" of Japan in Manchuria is the South Manchuria Railway Company. Though transportation is the main enterprise of this company, it operates coal mines, iron works, locomotive works, wharves, and warehouses on a large scale; maintains schools and hospitals; promotes public hygiene and undertakes various public works for the well-being of both the Chinese and Japanese within the railway zone. Besides, it controls a number of joint-stock companies, electricity and gas works; shipping and dockyard companies, as well as a chain of modern hotels for the comfort of travellers in South Manchuria. In point of volume of business transacted and scope of functions performed, the South Manchuria Railway Company is the most important in the Orient and perhaps in the entire Pacific regions. Manchuria has made phenomenal economic progress since the advent of Japanese enterprise. Before 1906 the Manchurians were a pastoral people and barely eked out a living by raising beans and millet for which there was no market outside Manchuria. To-day soya bean and bean products alone are exported to the extent of 425,000,000 haikwan taels a year because the Japanese created a world-wide market for them.

In 1907 the foreign trade of Manchuria, both import and expert, amounted to only 25,000,000 haikwan taels. In 1929 it was 75,520,000 haikwan taels. Its imports alone totalled 330,000,000 haikwan taels in 1929, of which Japan supplied 126,000,000, the United States 26,000,000, Germany 8,500,000, England, 9,670,000.

The principle of the "open door" in Manchuria is established, though British interests are declining in favour of Japan. Dairen is an international port. China in Manchuria, in the interests of her 30 million immigrants, is virtually assisting in a quasi military capacity the Manchurian Government against the Japanese. To a considerable extent both China and Japan are usurpers in Manchuria—the former in virtue of her great immigrant population; the other by her organisation and financial interests.

The military occupation of Central Manchuria by Japan has not only been a political calamity of the first order in itself, but has released a whole mass of discontents originating from other causes. The injury to Chinese national feelings and national interests is immense; and naturally the hapless Government is a scapegoat. The alert elements of the population cannot see the necessity of the non-resistance policy and most recent events show a decided strengthening of Chinese activity against Japan.

At Shanghai the small war between China and Japan can be explained something like this: The Chinese method of showing dislike for the Japanese has been to impose a trade boycott. Authoritative Chinese opinion states that one of the major reasons for the Chinese boycott was to vindicate what they claimed as a Chinese massacre by Japanese in Korea. This boycott has affected very seriously Japanese traders and also Chinese merchants trading in Japanese goods. The boycott was carried out by a number of guilds or semi-trade unions who entered shops and stores without ceremony and destroyed what Japanese goods they could find. It has been claimed that these guilds have no connection with the Chinese Government and for that reason the Japanese asked that the Chinese Government lift the boycott and, after negotiations, if the press news be correct, the Chinese Government agreed to restrain these unofficial bodies, but failed to do so. That the guilds who carry out the boycott are unofficial is seen by the power they have in a region like Hong Kong, where the boycott is often against the British as well as the Japanese.

It is probably true that the questions of Chinese boycott are psychological more than political. Japan, however, thought her only course of action lay in clearing up these unofficial bodies and thereby safeguarding the interests of her nationals, her trade and also the interests of those Chinese merchants who wished to trade with Japan. Unfortunately, the attempt to teach another nation how to manage its own affairs on its own territory is looked upon as an act of war and so the fighting continued.

This Japanese reason or excuse, according to your view point, brought about a remarkable resistance from the Chinese, which was a great source of pride to them, but has resulted in a practical destruction of the large industrial suburbs of Shanghai, known as Chapei, and the neighbouring port of Woosung. In spite of all this trouble the boycott is still in full operation and is still effective. Here is yet another explanation. It transferred at an awkward moment the attention of the world from Manchuria to Shanghai and the eyes of the Japanese people from their own troubled affairs.

The situation in South China is considerably different from that in the north. The term "Cantonese" is often used in speaking of the peoples of the south. The Cantonese as traders, commercial people and town dwellers have instigated world wide immigrations such as have penetrated the East Indies, the Malay Peninsula, and the cities of Europe and America. In this capacity they have always brought new ideas and new developments to South China. Long before the American idea of the "open door" was instituted Canton welcomed contributions made by its returning immigrants from the civilizations of the whole world.

The student movement in China is a powerful force and is at its greatest in Canton. The rebellion against the Manchu

Empire and present day radical movements in Chinese politics emanated from Canton. The South, too, is a region of many Chinese dialects and thus differs from the somewhat uniform dialect of the north.

The armies of the South are different from many of those found elsewhere in China, and have established a reputation for good discipline and good territorial administration. Within their own ranks they are often well equipped and possess well kept quarters. They have often assisted the common peoples in fighting disease, insect pests and floods. They have made roads, established schools and policed the community.

The South is responsible for the biggest psychological force at present working in China. It is called Sunyatsenism. This takes the form of national worship of the late Dr. Sun Yat Sen, and is fostered by a magnificent memorial hall and mausoleum in Canton. Sunyatsenism is a political message to the people of China, and the photograph of the "Doctor" is venerated in practically every house. His great work was to enunciate the principle of political and economic welfare of the common people and he had a great plan for the building of roads and railways to unify the whole of China. The idealism behind him has gripped the whole populace of China and is acting as a driving force. Much of Dr. Sun Yat Sen's work was influenced by Russian Sovietism so that periodically the political aspects of the South have a Communistic character. Out of Canton came the Kuomintang, which was originally a loose association of conspirators, but in 1923-1924 was reorganised on the lines of the Russian Communist Party, and by a combination of propaganda and military effort, eventually secured the submission of its ineffectual opponents. Canton, for long composed of narrow streets and slumdom, is now partly town-planned and great harbour works are being constructed so that this city, with a population of one million, will be the commercial and political capital in the South, and is entirely under the control of China.

The political and military power of Canton was sufficient to send an army and a body of students to Nanking, which forced the downfall of Chiang Kai Shek's Government. The Nineteenth Route Army, which emanated from Canton, withstood nobly the full brunt of the recent Japanese advance in Shanghai. Canton in its foreign relations alternates between forming "break away" parties of the Communistic type and exercising economic boycotts upon British and other powers at Hong Kong.

The general situation throughout China is one of a military overlordship. In general the military overlord gathers round him a large number of mercenary troops born in districts other than where they are quartered. These Chinese armies are not activated by patriotism, but by the question of getting a living. One aspect suggests the overrunning of the country by war lords who exist by taxing the people and so greatly disorganise local regions that it may be many years before they will recover. Another aspect shows that these armies, however, take many able-bodied men from the ranks of the labour market and what in a European country would be impoverishing the country by taking away able-bodied men from their villages becomes in China actually beneficial to the labour situation and to unemployment, which is an aspect of modernism formerly unknown in China.

The empire, which was a decentralised system in which local magistrates had the chief control, has passed away and there is in name a republic. But the governmental type of fixed institutions common to republics does not exist in China. The old provincial government under civil magistrates, which was the most powerful force in holding the Chinese together, still exists but has lost an enormous amount of its power. The modern programme is nationalistic in its assertion of Chinese interests against the power and privilege of all others and in its insistence upon the unification of the whole nation, with a strong central government to overcome the evils of provincialism and feudalism. The Kuomintang and the National Government have had no power whatever in certain regions, slight influence in some and only a variable control over many others. Scores of generals and provincial chiefs of the old regime entered the new organisations only for reasons of tardy expediency, and have always retained authority over their troops and revenues. Thus the "National unification" has been somewhat nominal and continually unstable; local interests and military combinations continue to imperil even the embryonic "national" government. Special cases are those of the Communists centred in Kiangsi province and the "Model Governor" of Shansi province, who is practically an independent ruler. The former last year resisted successfully thirty-six divisions under the direction of the highest central officers. In the summer and autumn of 1931, an important Cantonese group broke with the Central Government and was lining up for civil war when the Japanese moved in Manchuria.

The probable number of people under arms in China can be given as two millions. The three main army divisions are those of the Nineteenth Route Army of the south with Canton as its base, the armies in Nanking, and the army of Manchuria. The Nanking Government with its army probably does not extend its power more than a few hundred miles from Nanking. Any extension of power over a large area by any one army usually breaks down on account of its own size.

Because of the military regime the financial problem of China has passed into desperation. Exclusive of the payments on old indemnities and debts which absorb most of the Customs revenue, the National Government has used about five-sixths of its "free" income for military purposes. The armies are so vast that on a dangerously low rate for all ranks they are several months in arrears, with mutinies and transfers to enemy forces a serious reality. The Great World Powers are embroiled in this Chinese militarism; a state of affairs which came about in this way:

Situated in towns near the coast, and principally for the purposes of trade, there are land areas called concessions occupied by the twelve Great Powers. In some cases these concessions belong to one Power, as for example the British in Hong Kong, or to many powers as in Shanghai, and the area is then called an international settlement. Within these concessions protection is afforded by the navy and military of the nation concerned, or by some arrangement of international troops who protect the Chinese as well as their own nationals. In Shanghai the troops are controlled by British officers. Japan, it should be noted, does not have any actual concessions in Shanghai or elsewhere in China outside Manchuria. The point to note is that the foreign nationals as they are called are under the jurisdiction of their own country and do not come under Chinese law. For the purposes of law and order, then, each of the foreign countries keeps troops and warships in China although there is not any actual state of war between China and these Powers. The total number of troops in the north and the south in 1927 was 12,000. The Shanghai defence force of troops was until recently about the strength of one brigade. There is also a Shanghai volunteer corps of about 3,000 men of different nationalities. The Chinese navy consists of two small cruisers, four old cruisers, some destroyers and gunboats. In Chinese waters, however, all the World Powers keep war vessels as a protection against piracy and to preserve trade and peace in the concessions. They have often been used to protect the Chinese against unruly mobs of their own peoples.

The balance of forces in China is such that the foreign troops could not even by combination carry out anything like a war against China. At the same time they are sufficiently strong to be a protection against any unruly mob of Chinese people. In point of fact, the reserves are kept so low that when any serious rioting does break out it is necessary to have these troops reinforced almost immediately. How strong the Chinese resistance can be is shown by the fact that the Japanese in the recent Shanghai incident thought a few shells from the warships and a few marines would be sufficient but they had to send a considerable number of warships and call up reserves in Japan against the Chinese resistance over a distance of a few miles.

The two Powers which are principally concerned in these Eastern questions are the British and the Japanese. Affairs with other nations are on a very much smaller scale. As in Europe, Russia acts differently from other Powers and usually on her own account. In China she is present in Manchuria and controls almost 50% of the area. Inner Mongolia is practically a Russian Soviet and while the Russians have definitely expressed the opinion that Communism is not suitable for Chinese civilization, nevertheless they assisted the late Dr. Sun Yat Sen with large gifts of money and part of the Sen policy, so called, is closely allied to that of the Soviets.

In days gone by the Russians had a very imperialistic policy in regard to China and in point of fact attempted to carry out, up to 1905, practically the same policy as Japan is now carrying out in Manchuria. In those days, Dairen was exclusively a Russian port. At the present time the Russian liaison with China might successfully enable her to drive a wedge of interest between middle China and Manchuria which would give them their long felt desire for an Asiatic ice-free trade port. Little is heard of the Russian influence in China because it is considered that Russia is too busy with her Five Year Plan to have any imperialistic aims. There is considerable difference of opinion about the quiet persuasive way in which they are carrying out their work throughout the whole of China. There are many Communistic provinces already in existence. International trade policy in China is that of the "open door," which seeks equal treatment for all the Powers in regard to trade in China. Russia is on a somewhat different footing.

Economically China is of the domestic type in which the products of the land and industry are pooled among the clans or families so as to feed as many as possible. The communities were self-supporting. The enormous density of population and the desire for both food and modern commodities has meant that the Chinese nation has a large purchasing power. From the earliest of times, the East, namely China and Japan, has been considered a large market for Western goods and the export of the many Chinese articles. Apparently the only way this trade could be carried on was by the Chinese Emperor granting actual land similar to the East India Company in India. At one time, in point of fact, there were Chinese concessions in Japan for the same purpose. Whereas Japan put her affairs in order in such a way as to obviate the necessity for concessions China cannot be said to have done that yet. So trade between China and the rest of the world seems to involve trading nations taking possession of Chinese territory which thus places a Western judicial system in close contact with Oriental law. Further, with the fall of the Manchu dynasty, power which always rested with the local magistrate and never with a central government, is now transferred to any local army that is able to hold it. Local peasant farming groups will often pay a just war lord to remain in their district rather than be at the mercy of being repeatedly overrun by neighbouring unruly generals and armies. Any goods passing through China are required to pay taxes to the successive overlords through whose hands they pass.

In China also a number of people who have been using soldiery as a living, but who are not actually fighting, form a sort of banditry and live off the regions through which they happen to be passing. These "bandit corps" are often well disciplined armies.

The solution of many of these controversial Chinese issues must be sought, not only in the local regions such as Manchuria or Shanghai, but in the countries of the foreign nations concerned. In the case of Japan the most outstanding feature is her active foreign policy, of which her advances in China may be merely a phase. The need for an active foreign policy by Japan is probably a more pressing problem for the Japanese and the World Powers than anything that is happening in China.

The present population of the Japanese Empire is some 83 millions. It has doubled in the last 50 years and from the distribution in age groups the rate of increase of her people in the next generation will be equally as large as anything in the past. Contemporaneous with this increase in population there are diminishing returns from the rice fields and in agriculture generally. The whole agricultural system within Japan is in need of reorganisation. It should be kept in mind also that there is no great possibility of any increase in arable area in Japan.

Only 50% of the population of Japan is supported by agricultural production within Japan. Japan therefore is a nation fed upon imported food supplies, and trading largely with the food-producing regions of the world. The other 50% of the population of Japan is supported by the proceeds from industry. The two great problems in Japan are how to obtain sufficient raw materials for her industries and the extent to which these industries can be modernised so as to produce articles in great quantities at sufficiently low costs to supply a world market. Japan's reserves of coal and iron which are the basic materials of an industrial nation, are very small in amount and at the present rate of consumption will soon be exhausted. Other raw materials for her industries cannot be obtained in sufficient quantities in Japan so that she has instigated an active trade policy in raw materials. Japan then is an active trading country obtaining the products of coal and iron and also the raw products for manufacturing from lands outside Japan and selling in return to these lands manufactured articles.

Thus much of the wealth of Japan is produced by what are called "services." This need has brought about within Japan an entire reorganisation of her whole social and industrial system so that the nation is not unlike that of a Western Power. There is an organised central government, many trade unions and the general conditions of industry are much the same as in these Western countries. In like manner there is political discontent and unemployment. The question of over-population in Japan is so pressing that many solutions have been sought. Emigration from Japan has not proved a solution, though it should be noted that quite recently Japan has instigated a new policy of sending her farmers to Manchuria. The standard of living in Japan, considered from the average family income, suggests that it is higher than that of Italy or France, so that it is not easy for Japanese to compete as immigrants in the Pacific with more primitively organised peoples. An active trade policy, emigration and population control would seem to be the three solutions to the problems facing Japan. The active trade policy is the dominant one for the moment and this is being apparently supported by a military regime. The country nearest to Japan possessing large quantities of coal and iron and a raw agricultural product such as the soya bean is Manchuria and we find it definitely stated by the Japanese that their sole interest in Manchuria is to be able to carry on trade there. At the present time most of the raw products of Manchuria and Korea, the latter a colony of Japan, find their way into Japan. In the same way Japan has to a considerable extent financed many of the modern factories in other parts of China and largely controls the cotton industry of China. In recent years Japan has doubled her ownership of cotton mills in China, while the number controlled by Great Britain has greatly decreased. An active boycott by the Chinese is therefore a very serious matter for the livelihood of the Japanese nation.

China is concerned with even more exacting problems but they are of a different character. China proper is a region of extremely dense population in certain special localities. In that sense it is over-populated and an ever present possibility of famine due to floods creates an unorganised situation. There exist also, within the eighteen provinces, vast areas of untilled land which, with other methods of agriculture, might be made available. These parts represent about 20% of the total area of China. The extensive mountain regions of China are almost without cultivation and almost uninhabited. Vast reaches despoiled by the flooding of the Yellow River have never been reclaimed. Immense plains, sandy or semi-arid, are to be found within the limits of the eighteen provinces. All told, the population problem of China is one of distribution rather than of over-peopling. A re-distribution might be obtained by modern agricultural methods, modern transportation, application of modern science and good government.

Many parts of China are suitable for immigration, and one of these chosen is Manchuria. The numbers entering Manchuria in recent years have been greatly increased because Chinese immigration to Pacific countries such as the United States and Australia has been stopped.

China is the largest producer in the world of raw cotton. The principal region of production is the Yangtse Valley.

Over 50% of the cotton mills of China are in Shanghai. The majority of these mills are Chinese owned. The Chinese cotton industry, like her silk industry, is in keen competition with that of Japan. The finest white silk in the world is produced in the Yangtse Valley and manufactured in Shanghai. The recent efforts by Nanking University and other institutions for the perfection of the silk industry, suggest that China is making a serious challenge to Japan for the premier position of world's silk producer. Especially is competition keen in the American market.

The "riches of the East" as far as mineral wealth is concerned are becoming more precisely known. The coal reserves of China have been returned as about one-fourth of her pre-war estimate. Nevertheless China possesses the greatest reserves of coal in the Far East. Most of this coal is to be found, however, in one province, Shansi, and most of the remainder in Northern China. With regard to iron, China's reserves are less in amount than that of coal. While there is sufficient to satisfy the immediate needs of industrialisation in China and also opportunities for considerable advancement, doubt is expressed as to the total quantity being sufficient to form any great iron industry in China. It is interesting to know that Japan has control of 90% of the available iron resources of China and imports into Japan half China's crude iron production. Of other minerals, including some of the rarer minerals, China has fair supplies. But improved industrial conditions are necessary for their exploitation.

The presence of warfare in China has greatly hindered her industrial development. The China Year Book, 1931, shows that in North and Central China the coal production decreased from nearly 5,000,000 tons in 1923 to less than 1,500,000 tons in 1928. In north-east China, where there has not been much civil war, there has been an increase in coal production from 10,000,000 to 13,500,000 tons.

China, therefore, has a vast population whose numbers can only be estimated, and a country which has revealed but little of her mineral wealth and promises none sufficient to support a modern industrial country with a population of 400,000,000. Here is a land which yields its agricultural wealth to hard labour and infinite pains in conserving its fertility and where 85% of the population must be devoted to food producing activities. From these, there has resulted an economic standard of living lower than that of most civilised countries, and a frequency of famine, which has proved to be the chief check on population increase. The lack of efficient methods of transportation has further increased the drawbacks to overcoming the difficulties of natural environment. Probably the pressure of population on agricultural food supply, which prevents any great development of animal husbandry, has been responsible for the lack of transportation. The fact of a very large population requiring employment, the ease of water transportation on the large rivers of China, and an ancestor worship which is prejudicial to the utilisation of the land surface, have contributed to the present backward state of China.

The burden imposed upon the whole country by a system of manual labour has been expressed by one authority as follows:—

> "The average day's work for one man is one ton per one kilometer (.6 per mile). At this rate it would take nearly two million men working 365 days a year to carry the railway freight tonnage of the United States. Though the wage of carriers is about twelve cents (gold) a day, the average cost of freight transportation away from railways and waterways is ten times that of the United States."

Can it be said, therefore, that in spite of low wages and abundant labour, work is expedited and is cheap in operation? Another aspect of China is the insufficiency of the food supply. In spite of 85% of the population being engaged directly in agricultural production, very many people go hungry and there is insufficient to supply the needs of the people Much is done by a rigid personal economy. The greatest aspect of all China is the utilisation of every scrap of everything, nothing is wasted, even rusty nails are preserved. Large numbers are habitually under-nourished, and the birth rates and death rates are very high.

The first condition concerning Chinese agriculture, in which 70% of the cultivated area is used for rice growing, is the very small unit of the holdings. In the north of China, where the crops are wheat and corn, and where 40% of the cultivated area is used for wheat production, the average size of the farm is about 4 acres; in the south, where the principal crop is rice or mulberry leaves for silk, it is about 1½ acres. The average for all China is less than 3 acres. The Chinese Bureau of Economic Information estimates that for the wheat area of the north, it would take about 5 acres of wheat to give a sustenance allowance to a family of five. More than 50% of the farms in China are 1½ acres or less and there are few large holdings. On the other hand the intensity of cultivation is the remarkable feature of Chinese agriculture, but notwithstanding this intensive cultivation, it is estimated that not more than 15% of the surface of China is under crops. Much of the grass grown at present is used for fuel. If some means could be used to put grass-land into grazing, then the food supply would be increased. Another 20%, however, is capable of being cultivated, but to increase the percentage of arable land, some new methods of cultivation must be employed. The present Chinese Government is making provision for new farm implements and machinery to be given to the farmers. Afforestation and irrigation is being dealt with, new roads, better methods of transportation and a more even distribution of the population are being undertaken. The ability of the Government to supply the necessary scientific information and the capital is one of the great problems of China.

It is for the reasons of difficulties in agriculture, the low standard of living and over-population locally, that immigration is a powerful factor in Chinese affairs and why the Chinese Government requires the profits from their nationals in Manchuria to help them develop the country. Chinese needs in Manchuria, therefore, are as great as those of Japan. Immigration is not a pleasant prospect for the Chinese. Ancestor worship causes them to remain in the village where exist the tombs of their fathers. Thus religious beliefs hold the individual fixed, and are against migration. But civil war is causing the farmer to despair of his land and in bodily removing him for war services is a most important factor favouring migration. Another contrast in China is the low rural standard of living and the apparent richness of the towns. The fact that many of the large cities of China are concession areas in the hand of Powers foreign to China who collect customs and tariff taxes and who are middlemen in trade, as it were, has influenced the Chinese to demand the revision of Treaty rights and even the abandonment of their concession lands by the Great Powers. Now the regions of contact between the Oriental and Western Powers are through these concessions or settlements, and the trade that goes through them. Any modern industrialism which can be said to exist in China is in or near to the concessions or connected with the railways which radiate from them. There is no doubt that any further modernisation of China must come through these channels.

In many countries of the world it is possible to consider political and economic factors as separate issues, but in China and the East, politics and economic development cannot be separated. It has been claimed by many, therefore, that further industrialisation awaits the development of security and a modern code and judicial system. Were that forthcoming then it is claimed Chinese development would depend upon transport and finance. The problem arises then as to whether the finance can come from the Chinese people themselves or from foreign loans. If from foreign loans, has China the mineral wealth to allow her to develop? In proportion to the numbers of people in China, it has been reasonably claimed that China has not the required extensive oil or mineral resources. It has also been claimed that that is an industrial and economic handicap which the country cannot overcome. There are large deposits of coal and iron and opportunities for hydro-electric power on the rivers, but it is doubted if these would ever be sufficient to make China a great industrial nation in the Western sense. Therefore the question of extra territorial rights is the biggest aspect of the China complex. The Chinese claim that the concessions and the rights connected with them have been forced from them from time to time and they are impatient, not only to have the Treaties readjusted, but to have them done away with entirely. But not all Chinese want the concessions surrendered. In 1930 Chinese representing 300 villages petitioned the British Commissioner against the retrocession of the concession of Weihaiwei. Treaty revision has its perfectly legitimate aspects, but it may also play into the hands of an unscrupulous war lord or the money making propensities of an unscrupulous Government. To remove hurriedly these military treaties and the cities built on the concessions might be throwing the best Chinese element into the hands of the most unruly element. On the other hand it might remove the causus belli and so reinforce the hand of the sound element. The Great Powers claim that the Treaties are in order, that they are gradually relinquishing their rights, and that there is no unified power in China to guarantee the safety of trade, the return upon money loaned to the Chinese and the safety of foreign nationals. The British attitude is shown by the fact that they have already surrendered a number of areas and have completed agreements that surrender began in principle as from 1930. To remove the concessions immediately would probably bring about the complete cessation of organised contact between West and East for a time, and would probably disturb the whole balance of power in the East and the world in general. On the contrary, the probable increase in national wealth which will take place as China becomes organised, may cause increasing friction between nations trading in the East; even to-day a large percentage of the agricultural produce of North China is sold for cash. It is quite clear that nationalist feeling among the Powers is on the increase and political tensions are growing with specialisation in trade. It is clear, also, that international cooperation, of which evidence is not wanting, will produce sufficient for all since the separate nations' interests are greatly interdependent. Another great problem is how far industrialisation will allow China to come into line with the world movement for the centralisation of industries in the town. Japan in this respect has made many adjustments, but it is doubtful if the Chinese can change from their domestic industrial type, their village life and their traditional copyist skill to that of the factory system and all it involves. Many of the attempts by the Chinese at ideal factory laws have been carried out within the concessions. The Chinese Government claims that hereby the good government of industry is without their power. Much of the industry of China is carried on by child labour and it is claimed that until that can be overcome, no great advances in industrialisation can take place. Then again China is the only great nation which did not experience the discipline and the centralising effect of a feudal system. It is remarkable that the present stage of Chinese development is one of military over-lordship.

The great question is whether this will cause Chinese unity quickly or whether it will be a disturbing force and set China many decades back.

The new national spirit in China is no small thing. It has two aspects. There is that of the Cantonese, who are people inhabiting hilly country, growing tea, sugar, corn, cotton and rice. There is also that of the Northern Chinese, centred round Nanking, who are peoples living on large river plains, and who grow wheat, wool, oats and the soya bean. The differences between the Cantonese and the Nanking group are so fundamental that they have always been at loggerheads, but when facing the Japanese recently they agreed to sink differences and present a united front. Therefore, some see Chinese unity as a thing that will never be accomplished, others see an acceleration of the processes of national unity which in Europe took a few hundred years to accomplish.

There is no lack of plans to accomplish this unity and in this sense there must be a few millions of people who are aware of the aims and hopes of Chinese republicanism. The most elaborate plan was that of Dr. Sun Yat Sen and though very idealistic it is a measure of possibilities. There were to be three large ports on the eastern seaboard and three elaborate railway systems connecting them to the remotest parts of China. Then followed the contemporaneous development of the food, clothing, housing, motor and printing industries. Accompanying these would be the development of iron, coal, oil, copper, smelting plants and machine manufacturing. The northern port was to be on the Gulf of Chihli, just north of Tientsin; the central one on the Gulf of Hangchow and the third the port of Canton.

It is sufficient to mention here the northern railway systems which were to begin at the new port and run westwards in to the hill country and penetrate the undeveloped and sparsely occupied regions of Manchuria and Mongolia. The whole system was to extend some 7,000 miles. In all, there were to be 100.000 miles of railways and one million miles of roads, and this for a country possessing little or no capital. The plan was proposed to the Versailles conference and to the Great Powers with the suggestion that these great nations should apply one-half the sum of the cost of the Great War and all their organisation to the modernisation of China at the cost of £12,000,000 per day.

But this background is not the whole story about China. As in other countries personal motives interfere with public duties. The people have grown tired of the military policy of non-resistance to foreign aggression and until quite recently there seemed to be no effort, no purpose to deal with a general advancing movement of hostile armies. Bitter experience of the enormous and irksome Chinese soldiery has produced disappointment and disillusion with government and military leaders.

The more enlightened Chinese are asking what have been the benefits of revolutionary diplomacy, the advocacy of national rights and strong central government when they were insufficient to prevent the overrunning of Manchuria and the destruction of Chapei. The Chinese Government, with a weak case, leaned upon the League of Nations, and it would seem that from the Chinese public's point of view events have proved it so far ineffective. It is probably true that the existing League machinery was never designed to cope with disturbed Eastern affairs.

The great figure in Chinese political life at the present time is Chiang Kai Shek, and the great question is will he maintain his leadership now that revolutionary enthusiasm is passed. Trustworthy co-operation between leaders does not seem to be in existence and Chiang's firm administration may prevent the growing tide of anarchy and communism. Nevertheless, many Chinese questions are being dealt with and settled and the question of foreign treaties has reached the stage that foreigners within a short period of time will be subject to Chinese law and local jurisdiction. Special chambers have been established in Chinese courts to try cases in which aliens are involved and the law-makers of foreign nationality will be employed to help in bettering the administration of justice. It is held that when political stability is obtained these new treaties will be signed.

It is true then, that the mass of Chinese people are not yet awake to western realities. The few million who claim to speak for China know what they want but are divided in their efforts to attain it. When these new leaders are able to speak in the matter of foreign relations with a common voice then for all practical purposes China will be a united force. For China the consequences of disunity are even greater. The complete surrender to China by the World Powers might offer an opening to Russia via Chihli or the absence of a Chinese navy leave an opening for a strong maritime power. Yet again the dissipation of energy through internal strife may prove so great as to preclude any national or local advancement during this generation.

China, as foreseen by Sun Yat Sen, is passing through the stage of military dictation and learning the modern ideas, but whether she will be able to pass from a literary and agricultural clan system to an industrial and individualistic political unity in the formation of a centralised republic calls for much speculation. It would seem clear that a system of Federated States unified within their boundaries and able to offer security and settled administration for the development of transport and trade would be a step in the right direction. Help she must have from foreign Powers and the turmoil of treaty rights and concessions should not prevent unification provided she is sure that the Powers do not mean political and economic aggression as seems to be her present frame of mind towards Japan.

The Evolution of the City of Manila and its Strategic Significance

By CATHERINE D. J. BÀCK, B.Sc.

Manila, the capital city of the Philippines, is as modern as New York, yet its history goes back to the early centuries of the Christian era. The Philippine Islands, although situated over 7,000 miles from the Pacific coast of the United States, are an American possession and just as difficulties arise in the government of the remote parts of the British Empire so the Americans have problems to solve in the control of their far distant territory. Within a radius of 3,500 miles of Manila lives half the population of the world, so that an archipelago with as little undeveloped land as the Philippines and containing only 12 million inhabitants compared with the 400 millions of China is likely to be watched with considerable interest by the peoples of the Far East.

The Philippines consist of a group of eleven large islands and over 7,000 small ones, only about 2,500 of which have been named, lying entirely within the tropics and stretching from 5° to 21° N. The total area of the archipelago (114,000 sq. m.) is slightly less than that of Great Britain and slightly more than that of New Zealand. Luzon and Mindanao are by far the largest islands, their area forming more than half that of the archipelago. Manila is situated in Luzon, the northernmost of these islands. The capital city, which lies some 14° from the equator, is slightly nearer the equator than is Cooktown in Queensland.

The city itself, which covers an area of 14 sq. m., lies on low ground, only slightly above sea-level, and is divided into two by the Pasig River, which flows into Manila Bay. The harbour is entered through narrow straits, which rise to over 4,000 feet in the rugged Mariveles Mountains on the northern side and over 2,000 feet on the southern side of the entrance. Manila Bay is guarded by the fortified island of Corregidor, while two other small islands in the entrance, El Fraile and El Carabao, are also fortified. Manila Bay, with a circumference of 120 miles, is one of the largest land locked harbours in the world and until a concrete breakwater was built, considerable damage was done to shipping by typhoons on account of the large stretch of open water in the harbour. In addition to the construction of the breakwater a large part of the harbour has been dredged so that even the largest vessels may sail right up to the wharves. The material obtained from the dredging of the harbour has been used in the reclamation of land along the waterfront.

The city of Manila is formed of three distinct townships and each part reflects in its buildings the three distinct episodes in its history. The old city within the wall reflects in its architecture the Spanish conquest, while the new city is town-planned and traffic regulated as are the modern cities of the United States. Enclosing them both are the native villages of nipa matting huts and village agriculture almost untouched by Western civilisation. The central part of Manila, formed by the ancient walled city, is almost identical with that founded by Legazpi in 1571. Although the Spaniards were the first foreign peoples to take possession, it was Magellan who made the islands known to the Europeans. The Spaniards named the Philippines after Philip II. of Spain, during whose reign they were discovered. "Manila," however, is a name derived from a native word "manilad," which means a place where there are many nilads—flowering shrubs with white blossoms.

The stone walls enclosing the city have an average width of 16 feet, the space between the inner and outer walls being filled with earth. The construction of these walls, which are about 25 feet high and 2½ miles in circuit, was begun by Governor Santiago de Vera in 1594, and was completed by forced Chinese and Japanese labour. Within these walls the atmosphere is that of a mediaeval town. One building, Fort Santiago, has been standing since the beginning of the seventeenth century and contains many mysterious underground passages and dungeons. This is now the headquarters of the Philippine Department of the United States Army. Another building, Santo Tomas University, was founded by the Dominicans about the same time and was declared a university in 1645. This is the oldest university under the American flag.

It is, however, in the many churches of the walled city that the old world atmosphere is most manifest. There are 69 churches in Manila and many of these are to be found within the walls. In this region a great variety of architecture occurs but unfortunately many of the older churches have been destroyed by earthquakes. Possibly one of the most interesting however, is outside the walled city in Rizal Province at Las Pinas, which is about eight miles from Manila. This church was built in 1762 and in 1818 an Augustine friar began the construction of a bamboo organ for the church. It took four years to complete and in order to preserve the 950 bamboos which were used they were covered with sand for a period of six months. The organ has been damaged a number of times by earthquakes and rain but has now been repaired and is in working order. It is said to be the only organ of its kind in the world. However, not all the buildings within the walls belong to such a remote period. The Philippine library, government bureaux, several hospitals and institutions, as well as a number of shops have been built since the period of construction of the forts and ancient churches, but these belong to yet another period from that of the buildings in the American area. Parts of the walled city have been modernised and even one of the old bastions. This has now been effectively used in the making of an aquarium which has an excellent collection of many coloured fishes from the tropical waters of the Pacific.

The scene changes on passing from this ancient city through the narrow gates, which are only just wide enough to permit of one line of motor traffic and which, until 1852, were closed every night from 11 p.m. until 4 a.m. Wide streets, modern buildings, many of which are built of concrete to resist the earthquakes, and well kept parks, such as the New Luneta, which is situated on the reclaimed land bordering the bay, replace the narrow congested streets and closely spaced buildings of the walled city. Along the wide concrete roads signs warn the motorists, many of whom are Filipinos, that touring cars should travel at a "reasonable speed," yet even in this part something of the old method of transport may still be seen in the caromattas, double-seated vehicles drawn by small horses and driven by Filipinos.

This modern city has evolved very rapidly since the Philippines were surrendered to the Americans, thirty-four years ago. Towards the end of the eighteenth century Manila was captured by British forces and held in British occupation for two years, after which time it reverted to Spain, but in 1898 the Spaniards were forced to surrender the islands to the United States. The Americans have occupied the time which has elapsed since that date in modernising and beautifying the city, for the most part confining their attention to that part outside the walled area.

Under the control of Americans, Manila has been transformed from one of the most insanitary of cities in the Orient into one of the most healthful.

Modern health standards would not permit the old moat outside the wall to remain as a pool of stagnant water and a breeding ground for disease, so this has been filled in with the material obtained from the dredging of the harbour and has now been converted into an eighteen hole golf course.

Beyond the modern and walled cities much of the native life of the islands is still to be seen. In this part tribal economy and the process of obtaining a living from the land are the main features in the existence of the Filipinos, each house having its small rice field, poultry farm and grazing ground for the water buffalo. The quaint Filipino huts are made of bamboo poles and nipa grass and although their structure looks particularly frail, these buildings are supposed to offer as much resistance to the effects of earthquakes as do the concrete buildings of the American region. During Christmas and Easter many of the native huts are decorated with lanterns of coloured paper.

Within the walled city the streets are lined by many shops which sell the handiwork of the Filipinos, the product of the domestic industry of the native villages. Perhaps the oldest of these domestic industries is their beautiful embroidery work, taught to the Filipinas by the nuns who came over to establish convents when the islands became a Spanish possession. Much of the embroidery work is done on pina cloth, a very fine fabric woven from pineapple fibre. Another important domestic industry is the manufacture of panama hats. Many articles made from reptile skin, both by hand in the home and by modern machines in the factories, are also to be found.

Most of the Western countries have already witnessed a change from the domestic to the factory systems and this is now making its way into the Philippines. Although many of the Filipinos still do their work at home, a number are employed in modern factories largely concerned with the manufacture of luxury products.

Everybody in Manila smokes; men and women, old and young. To supply the large home market as well as a large demand overseas there are 90 cigar and 29 cigarette factories in the islands. Manila cigars are now world famous, their manufacture having begun in 1780, a quarter of a century before the first cigar factory was started in Havana, but tobacco cultivation was begun in the Philippines as early as 1578. The most important tobacco growing area is in the northern part of Luzon where the banks of the Cagayan River provide a region of very fertile soil. The valley of the river has a width of about 50 miles, and a large area of flat land is available for cultivation. During the rainy season large amounts of humus are washed down from the areas of dense tropical forest on the hillsides, and as a result artificial fertilisers are not necessary. Native tobacco is only used for the central part of the cigar, the outer covering being made of American tobacco, which has a much softer leaf. So the cigars are just like the city of their origin, Filipino inside and American outside. Working conditions are particularly good as the factories are well lighted and well ventilated. In one factory 40 per cent. of the 1800 employees are women who are employed for making the better grades of cigars.

In one part of a factory may be seen the ancient method of rolling cigars by hand at the rate of 100 to 150 per day, and in another part packing by the most modern machinery. In Manila some of the higher grades of cigarettes are also made by hand, machines only being used for the cheaper brands. Piecework is the rule and a person making 200 cigars would earn two pesos (4/-) per day. Living is comparatively cheap.

Poultry farming plays an important part in the occupation of the Filipinos in the provincial areas. The birds are not only kept for the purpose of providing a food supply, but also for the sport which they provide. Every Sunday afternoon cock fights are held in Manila and in the native villages on any day of the week cocks may be seen at practice. The birds are provided with steel spurs so that the conflict is very short and sudden, mostly only lasting a few minutes.

The Filipinos in their search for a food supply do not depend on nature, with its many vagaries. As we have domesticated our cattle, so the Filipinos have domesticated their fish. There are large fish ponds in which they breed their fish, feed them and when of sufficient size catch them. These ponds are to be found everywhere near Manila Bay, especially near Malibon, where they were first established. Native houses in Manila are built on piles about four feet above the ground to escape the effects of flooding and attack by insect life. Thus a parking space for the fishing canoe is very conveniently provided under the house. Quite a large amount of fish is now exported from the islands. Then salt is needed to cure the fish and for household purposes so near the ponds the water from Manila Bay is allowed to flow over the land surface and after being left for an hour or two to evaporate an incrustation of salt remains. The collection of this salt is quite an important industry.

The sea yields the material for yet another industry in this part. The Philippines have one of the richest of Molluscan faunas in the world and marine shells provide an important source of lime, which has formed the basis of a cement industry.

While Manila does not show such congestion on its waterways as is seen on the Chinese rivers, its floating population is by no means insignificant. The Pasig River, commercially the most important river in the Philippines, although only twelve miles in length from its source in Laguna de Bay until it reaches the sea, flows right through the centre of Manila and a number of bridges have been necessary to connect the northern and southern sections of the city. As well as this main waterway there are a number of large canals and on both river and canals many cascos and bancas are to be seen. The casco is a vessel averaging about 50 feet in length with straight sides and almost square ends and with bamboo slat floors and roofs of nipa palm while the banca is a long slim canoe usually built of logs. A casco is the only home which many of these Filipinos know and on it are kept all their possessions, not excluding their fighting cock. Most of the people on the river earn their living by fishing. The river is also a laundry for the Filipinos, the women from the native quarters washing their clothes from the banks.

Rice forms an important article in the diet of the Filipinos, as rice farming is an important industry. In many places the primitive method of grinding the rice by hand may still be seen. As the home supply is insufficient, some rice is imported. Rice fields near Manila are flooded naturally during the rainy season, lasting from June to October, and no irrigation is necessary here owing to the flat nature of the ground. The fields are divided into rectangular blocks separated by higher ground to hold the water. In more elevated regions, as in the famous fields of the Mountain Province, irrigation is necessary. On account of the very limited area of flat land here terraced agriculture has been developed, the terraces following the contour lines. Great care is taken to protect the fields from destruction by birds and animals. In this region the presence of water has been the dominant factor in determining the position of the villages and rice fields. Springs are to be found in places, and the water from these is led onto the rice fields by means of hollow wooden troughs. The soil on which the rice is grown as well as the stones holding the soil in position have been brought from a considerable distance to the fields. This terracing keeps the water from running quickly off the hills. It is thought that irrigation was practised in this part even before the Spaniards came to the Philippines. In the Filipino villages practically all the work is done by man. Even on the flat ground the carabao is the only beast of burden.

The Mountain Province is very important in the lives of the white population of Manila since it is here that they go to obtain a change from the city heat. Although situated only 17 degrees from the equator this part possesses a moderately cool climate owing to its elevation of 4,000 feet. Baguio, 175 mlies from Manila, is the centre of this region, and forms a wonderful mountain resort. While the annual average temperature of Baguio is only 64°F.; that of Manila is 79°F. The highest temperatures recorded during the year occur in May and June, when the average temperature at Manila is 81° F., but during the hottest period at Baguio the thermometer averages only 68° F. The hot season in this part lasts from the middle of March to the middle of May. As in other places the beginning of the hot season coincides with the end of the school year, so large numbers of people take advantage of the cool climate provided by the Mountain Province. In June, at the end of the hot season, the rains set in, and the roads to the mountains become impassable for some time. The Mountain Province has a much greater rainfall than that of the plain region, Baguio having an annual rainfall average of 181 inches, while that at Manila is only 77 inches. Since there is not very much seasonal difference in temperature, but a marked seasonal rainfall distribution, the seasons in this part are reckoned in terms of rainfall; the dry season lasting from January to May, the rainy season from June to October, and the relatively dry season from November to December. The Mountain Province produces large quantities of vegetables for Manila. The presence of good roads is an important factor in the finding of a ready market in Manila for products of poultry farms and market gardens.

Agricultural products provide a large percentage of the exports of the Philippines, the outlying regions yielding the wealth of the islands. It is estimated that only about one-eighth of the area of the Philippines is under arable cultivation, very largely due to the rugged nature of the topography, the mountains rising very steeply from the coast. Although over large areas the soil is rich, agricultural methods are so inefficient that large scale production is not possible. The small land holdings also tend to keep agricultural production at a minimum. The high regions of the Philippines, however, provide much timber and the lumber industry is of considerable importance to the Filipinos. The most extensive areas of production are in the south, although timber of great commercial value is distributed throughout the islands. The commercial forests cover 57% of the area of the archipelago and both soft and hard woods are found. Soft woods are largely used for making cigar boxes, while the hard woods are in great demand by cabinetmakers and builders. Many of the hard woods take a beautiful polish and it is for this reason that narra is in such great demand.

The most important items in the export of the Philippines are sugar, hemp, tobacco leaf and manufactures, copra and desiccated coconut, rice and timber. The Philippines are responsible for about one-third of the copra production of the world. A large number of factories for its conversion into desiccated coconut are to be found in Manila. The coconuts grow all along the shore in the very limited area of flat land available for cultivation round the fringe of the islands. By far the most important export, according to value, is sugar. A large amount of fuel is obtained from the waste material of the sugar industry.

Practically all the trade occurs with the United States and Japan. The almost complete absorption of trade by the United States is the result of free trade between these two countries while the great increase in the trade with Japan is due to the low price of Japanese goods. The trade with Japan increased from 0.05% of the total in 1901 to 6.68% in 1929; second only to that of the United States. For a number of years after their arrival the Spaniards carried on a lucrative trade with China, but now Chinese trade plays a very smal part here. In 1901, it formed 15% of the total, but by 1908 it had fallen to 0.06%. In 1928, it rose to 3.47%, but represented only about one-half of the value of Japanese trade with the islands.

The unit of currency is the peso, two pesos being equivalent to one American dollar. At the beginning of this year the Australian pound was worth only 4½ pesos (about 9/-) in Manila, so that shopping there is of little benefit to the Australian.

Trade operations have accounted for the large size of the city of Manila. Since there is no decentralization in the islands most of the trade of the Philippines passes through Manila and so provides employment for a large number of its 316,000 inhabitants. It has been estimated that the density of population in Manila is over 20,000 per square mile; comparable to that of some of the more congested suburbs of Sydney.

In 1918, the last year for which detailed figures are available, only about 10% of the population of Manila was foreign born but this has probably increased considerably since that date. There is considerable Chinese influence in Manila and throughout the whole islands it has been estimated that there are 500,000 native inhabitants having considerable Chinese blood, but only about 200,000 with much Spanish or other European blood. Thus only about 7% of the total population of the islands has much Chinese or European blood.

If the Chinese and Japanese are excluded, only some 2% of the population of Manila is foreign born. Though Americans form a very small percentage of the population, they have wielded considerable influence in Manila. Through their agency, education in Manila is now making very rapid strides. Since the American occupation the English language has been used as the medium of instruction. At the present time about 1½ million Filipinos have a fair command of the English language but only about half a million speak Spanish. Filipinos have been very ready to take advantage of the experience gained by Americans in their educational establishments and as a result their Universities and various educational bureaux are undertaking very valuable work. Much valuable information is being collected at the weather bureau and observatory, where very good seismographic instruments are to be found. Many members of the staffs of the various educational establishments are American trained Filipinos who not only work like the Americans but have adopted a similar mode of living. This type of Filipino has also become accustomed to clothes which might have come from any New York shop, but the great majority of the Filipinos still wear their native costume. The men are dressed in coloured shirts of fine embroidered muslin, worn hanging over their trousers, while the women's costume consists of a skirt of fairly coarse material, usually dark in colour, and a very beautifully embroidered blouse made of fine material similar to that used for the men's shirts. Even the poorer classes of Filipinos have their clothes trimmed with their embroidery work and make quite a pretty sight as they walk along the street to the sound of their wooden slippers clicking on the pavement. As if to match their costume, the expression on the faces of the Filipinos is particularly cheerful.

As a result of carrying heavy loads on their heads many of the women have developed a very erect carriage. They do not wear hats and so are able to show to advantage their beautiful hair, which they are not permitted to cut. A number of the younger girls, whose hair reaches to the hems of their skirts, may be seen, while the older ones wear their hair "up" as Western women do. This fashion of not cutting the hair is one instance of the fact that tribal customs are still strong in the Philippines and it is said that in many instances the tribal laws wield a much greater influence than do those of the American administration.

For some time the most important problem in the Philippines has been the question of their independence. The Filipinos are an Eastern people who have been brought under the control of Western civilizations for over three centuries, first under that of the Latins through the Spaniards, and later under that of the Anglo-Saxons through the Americans, but now some of the Filipinos are very anxious to obtain their freedom. According to recent press reports the Senate Territories Commission has agreed to an independence plebiscite fifteen years after a new constitution for the islands has been adopted, so that the Filipinos may be able to gain their independence at some future date. Of still more recent date is the news that the United States House of Representatives has passed a bill to grant independence to the Philippines at the end of eight years. There is a great desire among farmers of the United States that independence should be granted to the Philippines since if they were free the Filipinos would be unable to send sugar and other products to the United States, and home growers would benefit.

It is said that this great desire for national independence is the most important fact in the development of national unity in the Philippines. Many of the Filipinos desire their indepence so that they might return to the more simple ways of living provided by the tribal system. They claim that Western civilization with its modern machinery and ways of living has deprived them of their happiness and care free existence.

At present the Japanese are allowed entrance to the Philippines on a quota basis, but already large numbers of Japanese who have gained entrance illegally are to be found in the Philippines. Peaceful penetration by the Japanese is occurring in Mindanao and the uncertain policy of the Americans in regard to the Philippines may mean that it would not be very difficult for the Japanese to gain control of the islands.

Obscured for centuries in a shadow of mystery and backwardness, the Philippines under American control and with improved trade advantages are to-day an awakened and progressive country producing not only the essentials, but the luxuries of life, and purchasing in return large quantities of the manufactured products of other countries. Although their period of government has been very brief the Americans have certainly done a great deal for the Filipinos and if they should cease to control the islands their future development might be much less rapid than it has been since the American occupation. Nor is the advantage entirely on the side of the Filipinos, for while the Americans still hold control of the Philippines they occupy an important strategic position which is of no small significance to all the countries which border the Pacific.

Australian Food and Game Fishes

By DAVID G. STEAD.

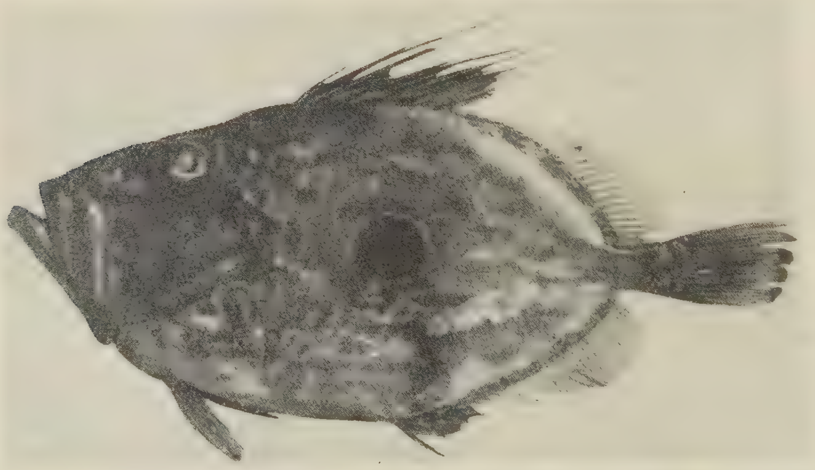
Australian waters are very well supplied with a great variety of both food and game fishes. Most of the kinds which fall within the category of game or sporting fishes are also of very great present or potential importance as food fishes. With an enormous coastline reaching from the near-equatorial regions to the cool waters of the southern shores, washed by the Southern Ocean, reaching away to the Antarctic continent, it is natural also that there should be an extreme amount of variation in the species presented. On the whole, however, the fish fauna suggests a northern or Asiatic origin rather than a southern or Antarctic one. There are certain noteworthy archaic types also which have been among the faunal features that have caused many writers to designate Australia as a land of "living fossils."

While many of the inshore or estuarine and some riverine fishes have been more or less recognised as game fishes in Australia for a century past, it is only in comparatively recent times that we find any widespread notice of our heavily endowed oceanic waters. These contain representatives of every known world group of sea game fishes and of most of the important food fish groups as well. I include in this reference, of course, a number of species of the shark kind, which although not usually recognised as food fishes in Australia, are sure to play an important part in that respect, both for home consumption and for export, just as they are gaining in favour among rod and line fishermen because of their so-called sporting qualities. Many of the greater game fishes of the world, well known to sportsmen and to the nationals of other countries, by various names, are to be found abundantly on many parts of our extensive seaboard.

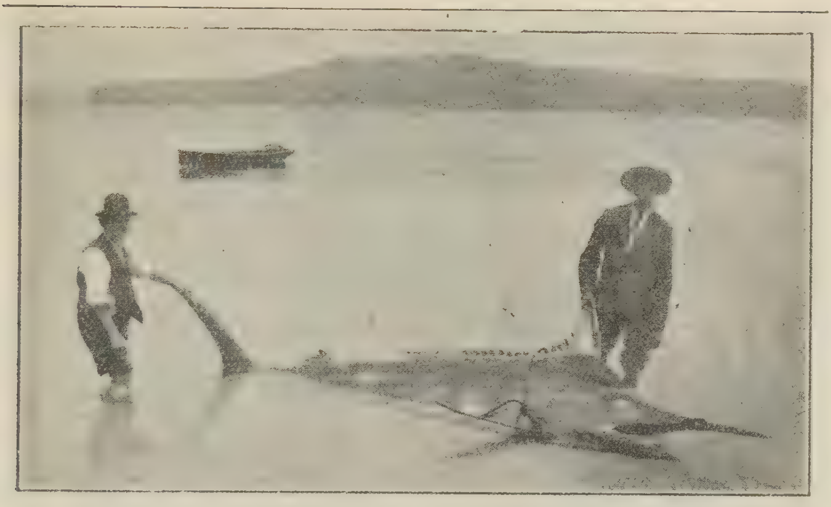
In this brief reference to my subject I will have to content myself in the main with the furnishing of a number of illustrations of some typical food and game fishes, to which I append some short general notes. The subject cannot be lightly dismissed, however, in view of the great possibilities for future development of economic fisheries which will bring in their train not only a vast employment of workers in Australia, but almost a concomitant revolution in their manner of life and food habits. In the State of New South Wales we have witnessed the unique changes in fish food supply brought about by the introduction of deep-sea trawling, which although only in operation for seventeen years past has brought under tribute an entirely new food province, while the few vessels have produced more in the way of fish food products than many hundreds of inshore fishermen working the estuaries and coastal shallows. The species of fishes handled, too, have been additional to those previously marketed or were only previously seen in negligible numbers. A similar development is still awaited in other States of Australia. But even this important change is but a forerunner of the changes that may come when our pelagic fisheries are developed to anything like their full capabilities and when many fishes now only looked upon as of interest to the sporting fishermen, because of their fighting qualities or ferocious character or great bulk, are regularly brought into economic use. In this connection readers are referred to the author's summary of the position in the article "Marine and Freshwater Fisheries of Australia" in the Commonwealth Year Book for 1924, and also the article: "Development of Northern Australia: With Special Reference to Australia's Tropical Fisheries," which appeared in Vol. 1, Part 2, of "The Australian Geographer."

Most Australian readers who regale themselves at times with tales of the mighty prowess of fishermen in other parts, are not aware when they read of "Leaping Tuna," of Albacore, of ferocious "Barracuda" (not our Barracouta), of Marline Swordfish, or Black Marline, or Sailfish, or Mako Shark, or the vast Devil Fish—the Manta Ray—that these and a host of other well-known sporting and food fishes are quite abundant at various points along our seaboard. Among the fishes of first-class importance both as edible and game fishes are the various kinds of Spanish Mackerel (Scomberomorus), Kingfish (Seriola)—known in Victoria as Yellowtail—various Tunny and Mackerel kind, Salmon (Arripis), and others.

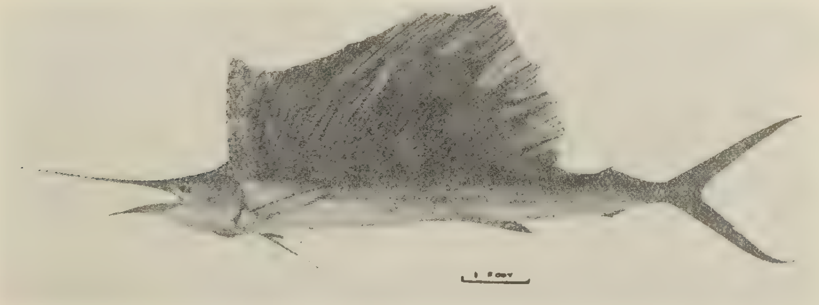
The following illustrations portray but a few of the several hundreds of notable kinds of fishes worthy of the notice of the economic geographer and of those interested in the commercial and tourist development of the vast Australian region.



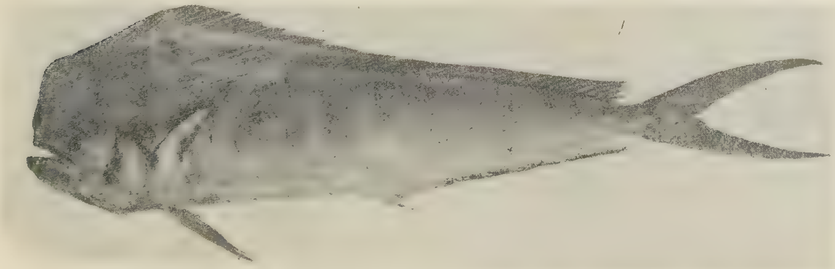
AUSTRALIAN JOHN DORY: Fine food fish caught by line on reefy grounds at sea, and frequently taken in the trawl net. Widely distributed.



"MARLINE" SWORDFISH: Known also as Black Marline and Spearfish. Not uncommon in open waters on many parts of Australian coast. Great Game and food fish. Much sought after in New Zealand waters. Specimen taken at entrance to Port Jackson.

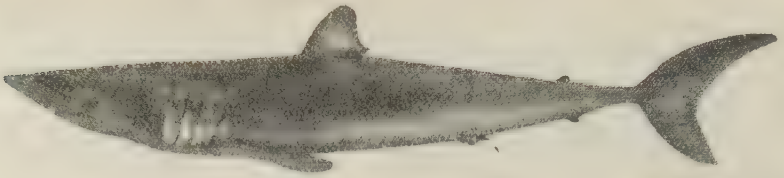


SAIL FISH: A kind of Sword Fish, sometimes known as Bayonet Fish. Common in Australian seas. (The sail-like dorsal fin may be lowered entirely into a groove in the back.) A great game and food fish.

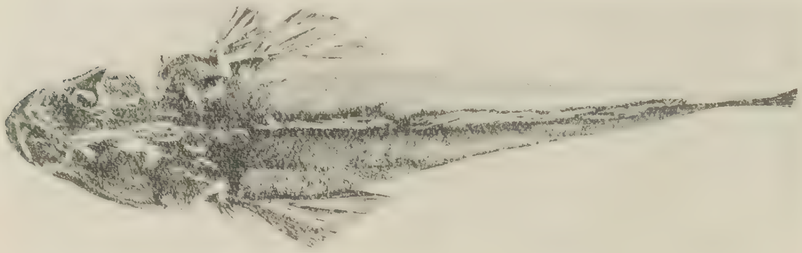


DOLPHIN FISH (Coryphaena): An open sea fish very common in Australian waters. Attains 6 feet length. Changes shape considerably with age. Compare photo. of smaller specimen in Australian Geographer, No. 2, page 17. Fine food and game fish.

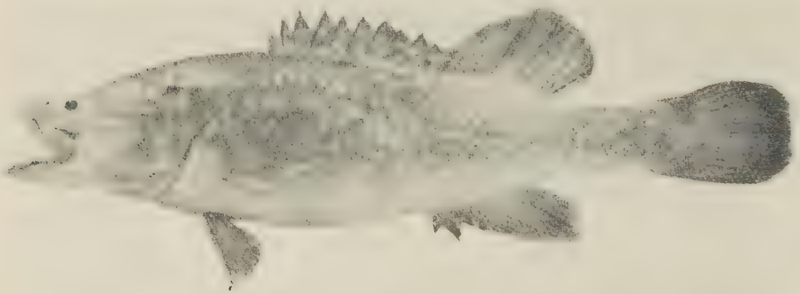
4



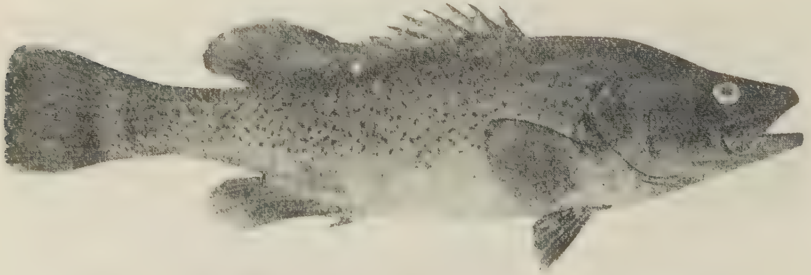
BLUE POINTER SHARK: A great game fish, very common in Australian Seas. Attains to 16-18 feet in length. The "Mako" of New Zealand.



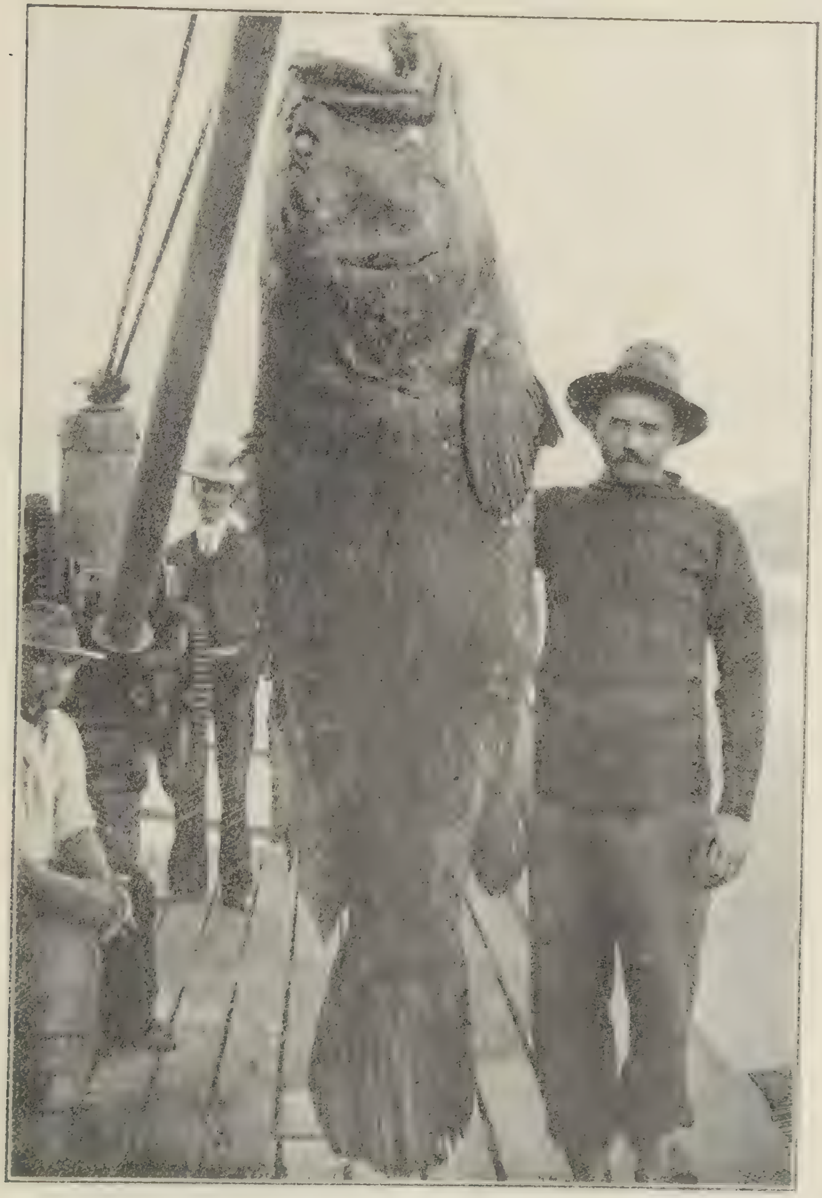
FLATHEAD: Many species of flathead are found in Australian waters. Some penetrate estuaries and others are found only at sea. All bottom fish. The Tiger Flathead is the principal fish taken by New South Wales trawlers, and is a first-class edible fish, much sought.



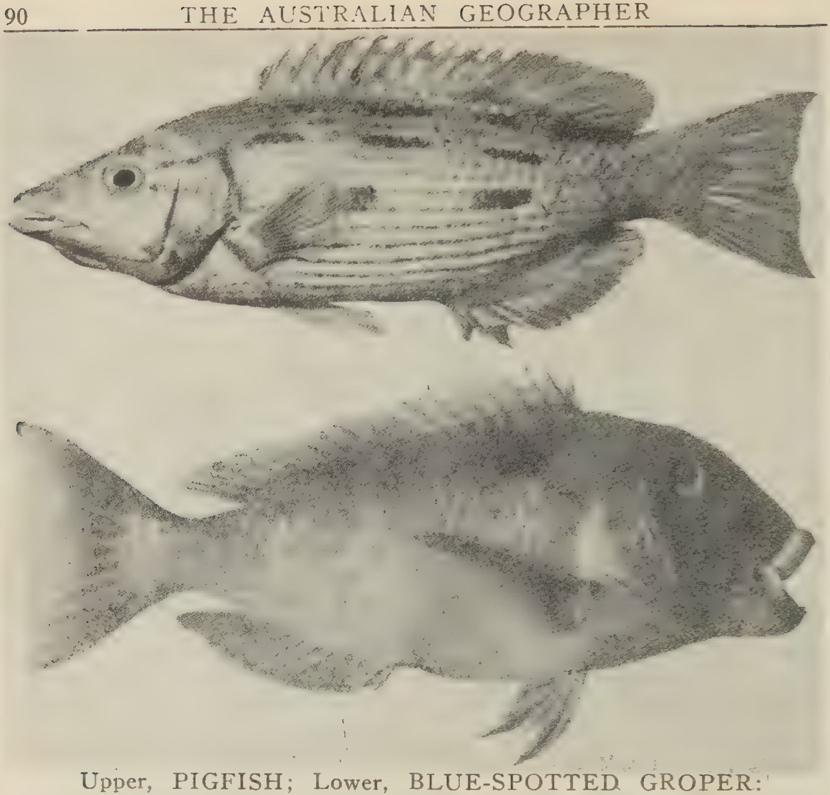
MURRAY COD: The king of Australian fresh-water fishes. Much sought after for food and sporting purposes. Attains to a weight of 150lbs.



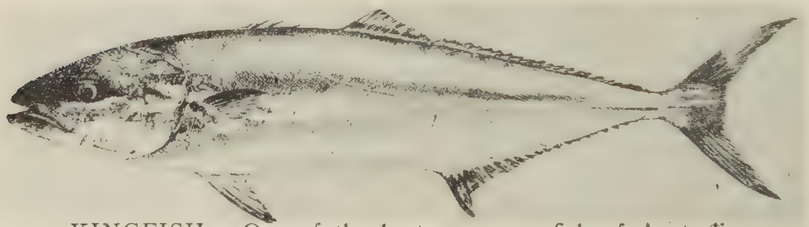
TROUT COD: This is Oligorus mitchelli, a near relative of the Murray Cod, with which it is frequently confused. Attains 20 lbs. weight. Note long upper jaw and spotted side. Murray Cod always has mottlings, and no spots. Lives more freely in open stretches of river, and not such a "lurking" fish as the Murray Cod.



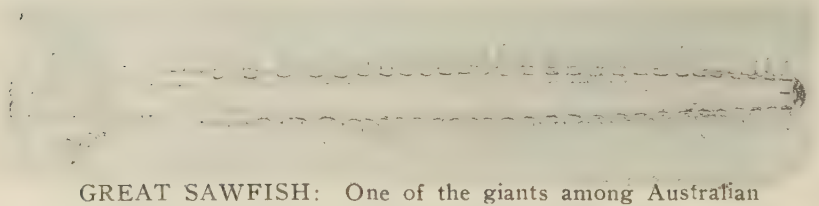
QUEENSLAND GROPER: A great food fish, of the perch type, allied to the Murray Cod, but living among rocks and reefy places. Penetrates many northern estuaries. This specimen, weighing over 500 lbs., taken at Maclean, Clarence River, N.S.W. Attains to more than 600 lbs. Common along whole of tropical and sub-tropical coastline of Australia. Often called Black Cod, but not to be confused with the Black Rock Cod.



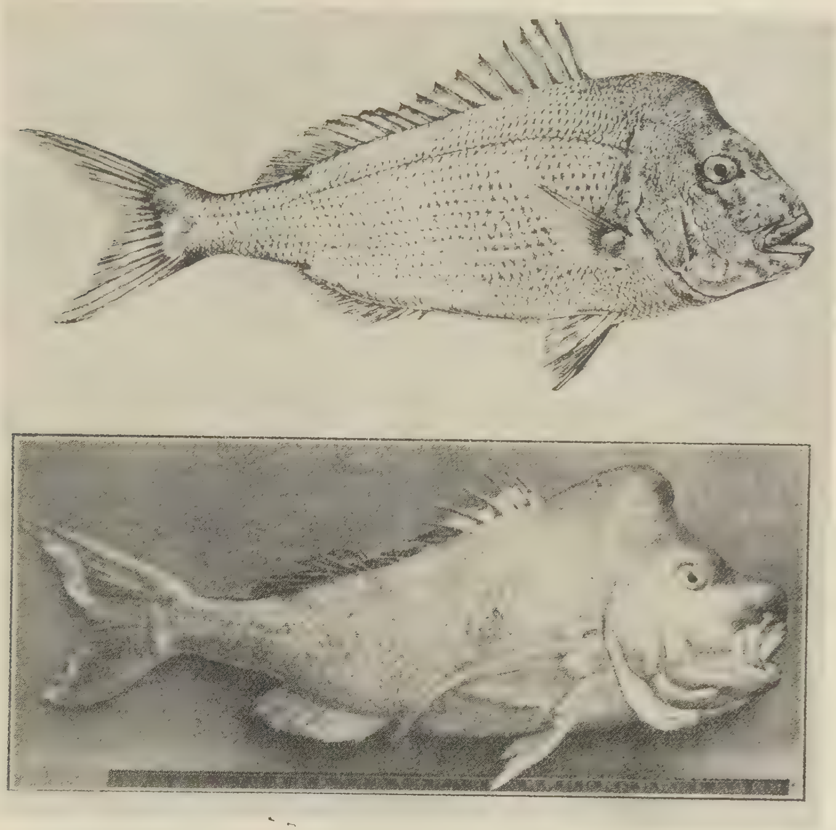
Upper, PIGFISH; Lower, BLUE-SPOTTED GROPER: Both are species of what are generally termed Parrot Fishes, of which there are many species on various parts of the Australian coastline, chiefly on reefy grounds at sea. They contain many species of great edible importance and some highly valued by anglers.



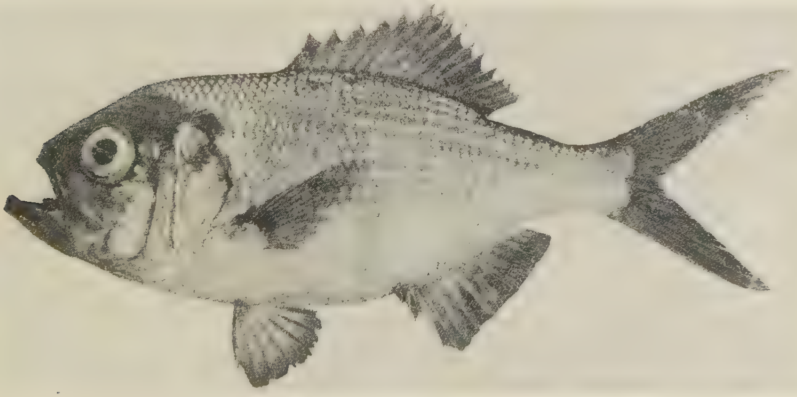
KINGFISH: One of the best sea game fish of Australian waters. Very widespread. Much valued for food. Attains 6 feet in length. Known in Melbourne as Yellowtail. The Kingfish of Melbourne is the Jewfish (Sciaena).



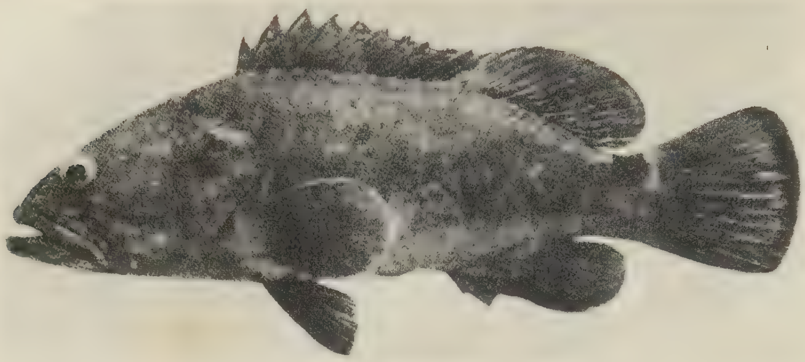
GREAT SAWFISH: One of the giants among Australian sea game fish. A shark-like creature attaining 18 feet in length. The "saw" is often 5-6 feet long.



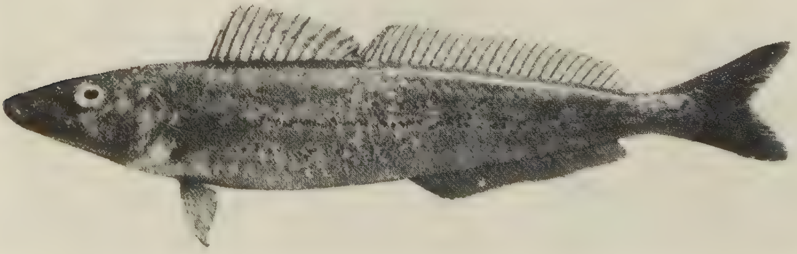
SNAPPER (not Schnapper): Very common in many coastal waters of Australia. Fine sporting and edible fish. Known at various ages as Cockney (or Cockney Bream), Red Bream, Bluenose or Bullnose Bream, School Snapper, Squire and Old Man Snapper. Attains 30 lbs. weight. (Upper, "Squire"; lower, "Old Man.")



NANNYGAI: A good food fish found at sea. Caught both by trawl and handline. Much valued by anglers. Of interest to naturalists because of archaic characters.



BLACK ROCK COD: Fine food fish. Lives in reefy situations, and grows to 80 lbs. weight. Widespread on Australian coast. Often confused with Queensland Groper. Can always be identified by black saddle over back of tail.



SPOTTED WHITING. A food fish of great value, found in large numbers on sandy bottoms along the shores of Southern Australia. Specially abundant in waters of Spencer's Gulf and Gulf of St. Vincent, in South Australia. Upper figure shows one catch of 3,600 taken with net at Port Lincoln, S.A.

Through Persia to Russia

BY E. J. BRYCE, F.R.G.S.

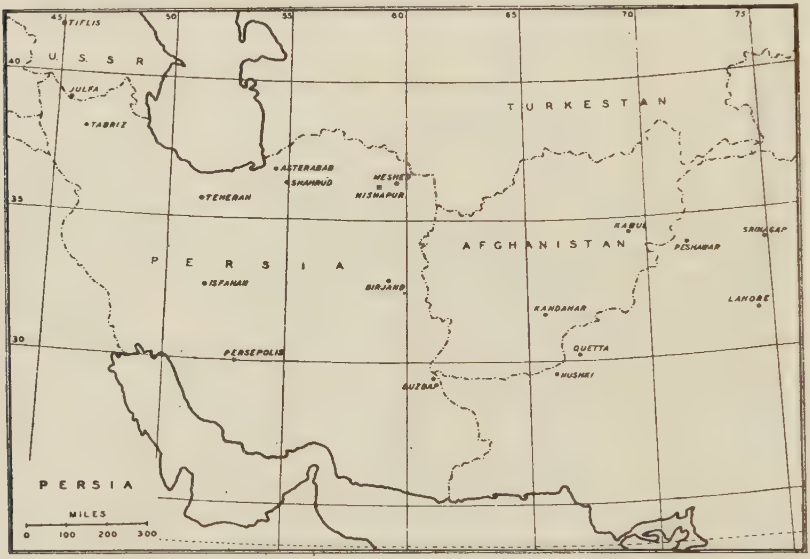
Early last year I decided to visit Russia and the Caucasus, a part of the world I had long wished to see. This necessitated traversing Persia, a country interesting to Australians, as the climatic conditions of both places have much in common.

Arriving in Bombay, we, my wife and I, made our way to Delhi and Peshawur, a train journey of 1,450 miles, from where we visited the Khyber Pass, the most famous of the Himalayan Passes from the plains of India to the central Eurasian plateau.

The Khyber is the main route between Peshawur and Kabul, the capital of Afghanistan. Its situation relative to these two places, its moderate height (the crest at Landi Kotal is only 3,500 feet above sea-level), and the plentiful supply of water which it enjoys in an otherwise arid region, have all combined to give it a unique position in history and romance. On either side of the crest of the Kabul hills are two small streams, one flowing north-west to the Kabul River and the other south-east towards Jamrud, the beds of these streams forming the Khyber defile. The Pass begins near Jamrud, about 10 miles from Peshawur, and, twisting through the hills for some 30 miles, debouches at Dakka, on the Kabul River, the most important points on the route being Ali Masjid, where road and rail penetrate a deep gorge, and Landi Kotal, at the summit of the Pass. Twice each week one sees long caravans of camels and pack ponies from the transborder tribal territory wending their way through the valley and making for Peshawur.

We retraced our steps to Lahore, and, at Rawal Pindi, an important military station, left the main line and made a side trip to Kashmir. "An emerald set in pearls"—thus have the poets of many ages described Kashmir—land of rich forests and upland pastures—slow-flowing rivers and glittering mountain torrents—ringed with a girdle of mountains, snow-capped through all the year—a garden set between the wide sunbaked plains of the Punjab and the maze of the great Karakorum Ranges. Many of the peaks visible from Srinagar, the capital of Kashmir, are over 20,000 feet high; Nanga Parbat, to the north, rises up to 26,000 feet.

A 200 miles motor journey, partly through the Jhelum River gorge, brought us back to Rawal Pindi, and then we proceeded to Quetta, in Baluchistan, through the Sind Desert, crossing the Indus near Sukkur. The military station of Quetta, of great strategical value, lies at an altitude of 5,513 feet above the sea in an arid plain, near the eastern end of the great Iranian plateau. A feature of the town are the well-kept, broad roads, lined with Chenar and Bluegum trees. Quetta is provided with an excellent water supply, the water being brought a considerable distance from the hills on the Afghan frontier. The stage from Quetta to Nushki, the former terminus of the Indian railway system, is through mountainous country, after which the train passes through the dead level of the desert of Baluchistan to the Persian border town of Duzdab, 420 miles away. The countryside is dreary beyond description; nothing but sand and camel bones meet the eye, varied by a few wild-looking tribesmen congregated at the few fortified railway stations. Duzdab, in Persia, is a new town, having come into existence since the railway extension into Persia. Previously, the district enjoyed a bad reputation, Duzdab being Robbers' Well. Now, however, under the strong rule of Riza Khan, conditions have much improved.



The Persian Empire occupies the western and larger part of the Iranian plateau, which is situated between the Indus on the East and the Tigris and Euphrates on the west. Most of this plateau is above 4,000 feet high; Shiraz, in the south, Ispahan, in the centre, and Hamadan, in the west, all lie above 5,000 feet. Persia extends, roughly, about 700 miles north and south, and 900 miles west and east, over an area of 628,000 square miles. A number of mountain ranges, running south-east to north-west, intersect the country, some of the mountains rising to a considerable height; near Hamadan, Mount Alvand rises to 12,000 feet. At Teheran, the Elburz range separates the plateau from the Caspian provinces, throwing up the stupendous peak of Demavand, which dominates the capital at an elevation of over 19,000 feet. Moving westwards, at the extreme north-west corner of Persia, historical Ararat rises to over 17,000 feet.

There is very little water in Persia, and, in the high ranges, the snow is preserved from melting during the winter to provide irrigation water for the crops in the spring. The rivers of Persia are of little importance, only one, the Karun, in the south-west, near the Persian Gulf, is navigable, and that for merely a short distance. The Persian plateau is covered with steppe vegetation. This signifies that instead of grass, there are stunted bushes growing several feet apart from one another and not covering the ground, resembling our spinifex in the interior. Between them, in the spring, blades of grass afford scanty grazing for sheep and goats; the bushes serve as camel grazing or fuel. Cultivation is generally carried on by irrigation, an elaborate system of "Kanats," or underground aqueducts, dug out of the hard soil in order to distribute over the largest possible area the meagre output of some slender spring or mountain stream, testifying to the indefatigable industry of the Persian peasant. The north-western province, Azerbayan, however, is much better watered, and the crops of wheat and barley are rain-fed. These are the main crops, barley being the staple horse feed.

Persia is especially rich in fruit. We owe to her the peach—the word is derived from the Latin persica—the orange, the lime, the pistachio nut, and possibly the vine. Of flowers, the jasmine, the lilac and narcissus not only come from Persia, but have retained their Persian name. The population, estimated at about 10 million, is sedentary and nomadic, the latter aggregating perhaps one-fourth. The nomads are divided up into powerful tribes; amongst the most numerous are the Kashgais (of Turkish origin), the Bakthiarias (of Persian stock), the Turkomans in Khorassan, and the Baluchis. The Persians are Aryans and came into the country about 1500 B.C.

Persia is rich in architectural remains, the principal ones being the ruins of Persepolis, the old capital of the country in the days of Darius. The great hall of Xerxes was the largest and probably the most magnificent structure the world has ever seen. It covered about two acres and a half. The palace of Darius was a materpiece of architectural skill. At the portals stood figures 15 feet high, similar in style to the Assyrian bulls of Nineveh. The celebrated relief of Darius on the rock of Bihistun, near Hamadan, surpasses all other rock sculptures in scale and in importance. The sculptures and texts occupy a carefully prepared space of about 60 feet wide by 23 feet high. It depicts the famous scene of Darius, followed by two officers, setting his foot upon the figure of Magian Gaumata, the usurper of the throne.

The foundation of the Persian Empire by Cyrus the Great in 550 B.C. constituted an event of supreme importance in the world, inasmuch as it was the first great Aryan Empire, and, practically ever since, Aryans speaking Aryan tongues have ruled in the Near East and in Europe. In the 7th century, Persia was overrun by the Arabs, who introduced Islam. Prior to that event, the Persians were Zoroastrians. A community of 10,000 of these Fire-worshippers have survived in Yezd to this day.

Persia is the only large country in the world without a railway, excepting the few miles of the Indian line, with its terminus at Duzdab, and the Russian constructed line from Julfa to Tabriz. If one travels in Persia, one must travel self-contained. Persia does not cater for tourists. Thus, when arriving in Duzdub, we were busily engaged in arranging for our transport and laying in supplies of food and drinking water for our motor journey to Meshed, 600 miles north.

We owed much to the help and hospitality of Mr. Ward the English missionary, and through his good offices were able to join a caravan of pilgrims on their way to Meshed, the holy city of the Shiah-Muhammadans. To avoid the heat, the first 150 miles were covered at night. A hot wind blowing across this patch, which is sometimes fatal to human beings as well as animals, is known as the Dask-i-Lut. The so-called road was in an appalling condition due to neglect. This road was constructed by the British Army during the war. The country through which we passed was arid without a tree or shrub of any kind, and the few villages consisted of flat-roofed houses built of sun-dried mud-bricks. Because good plants are rare in that treeless country, the natives made their floors of earth, but the earth floor wears poorly and kicks up in a dry climate. Therefore, rugs are used extensively for warmth and decoration. In the evening of the next day we arrived at Birjand, a town of 6,000-8,000 people, all employed in making carpets. We stayed at a caravanserai, an Eastern inn, with a courtyard for the animals and vehicles in the centre, and rooms upstairs for the convenience of the travellers. The cubicle allotted to us had nothing but bare walls and an earth floor; it was quite devoid of furniture, with the exception of a low wooden bench about two feet high, which served as a bed, as well as a table and chair. It was advisable to use plenty of insecticide, as, in addition to a variety of well-known insect-life, these inns harbour a tick known as the "garib gaz," or stranger-biter, the bite of which incapacitates the victim by a relapsing fever. The next day, late in the afternoon, we came to Tarbet-I-Haidari, to whose gardens of poplars, planes and fruit trees a Norman air is given by a succession of ruined watch towers. Not so long ago these border towns were subiect to raids by Afghans and Turkomans, who carried their victims away to Khiva and Bokhara to be sold as slaves.

The landscapes in Persia and also later in Eastern Transcaucasia were brown and generally dreary. There is a certain impressiveness in the wide views of bare brown open plains and stern red mountains which are so often before one in these countries. On the 4th day we passed a mountain range, from the summit of which we could distinguish the Golden Dome and Minarets of Meshed, the place of Martyrdom. Here was it, that

Imam Riza, a descendant of the Prophet, was killed by the soldiers of Harun-al-Raschid, the Khalif of the Arabian nights, after the holy man had fled into the wilds of Khorassan. His followers erected a shrine, to which every devout Shiah makes a pilgrimage at least once during his life.

The great Mosque dominating Meshed and seen many miles away is one of the architectural sights of Persia, the golden dome, the four minarets with their rich design of tiles of a beautiful turquoise blue shade, makes it one of the finest specimens of Moslem art in the world. Meshed is a large town of about 250,000 inhabitants, surrounded by a mud wall and intersected by wide avenues, down the centre of which runs a channel bordered by stately Chenar trees.

From Meshed we travelled westwards to Teheran, a distance of 650 miles, crossing the Salt Desert, "Dasht-i-Kavir," and subsequently the Elbruz range. Our way led us through Nishapur, the birthplace of the Persian poet, Omar Khayyam, where we spent the night in a better class Persian house. These houses are for the most part built round a sunk court and garden, in which is usually found a fountain or running water of some kind. Persian gardens are all alike in their insistence on water and trees. The rectangular plan for gardens with central pool and straight canals must have continued without interruption through Persian history. It is depicted on ancient earthenware bowls from Samara, on Rhages' polychrome pottery, and in garden carpets similar to one in the Persian exhibition in London not long ago. The wall of a Persian garden is so protectively high that none of the barren, dusty country round about is visible.

The next night was spent at the ancient town of Sabsawar, the fortifications of which are still intact. Two more days of rough travelling over sand dunes and salt deserts brought us to the Elburz range, and there at last the country improved and native trees of the cypress order indicated a better rainfall. The average rainfall of the country through which we had passed is from 8 to 10 inches a year. At the foot of the Elburz range lies Teheran, the capital, a city of 500,000 inhabitants. It is being rapidly westernised, much of the old bazaar quarter has been demolished, the streets are widened, and the walls razed to the ground. A great deal of the charm of the ancient East has disappeared in Teheran, however. Ispahan, the capital of Shah Abbas the Great, still retains its medieval character, and to this place we repaired without delay. Before going south to Ispahan, we applied to the Russian Consul for a visa to enter Russia. Permission had to be obtained first from Moscow, and we were relieved after eleven days' delay to find that our request was granted.

In Ispahan the busy scenes of Eastern Bazaar life is still going on as of old; perhaps nowhere else in the East have conditions changed so little in the last 300 years. But the city that was at the height of its glory in the days of Shah Abbas, which excited the wonder and admiration of European travellers in the days when Elizabeth reigned in England, is only a shadow of its former self. However, even now the bazaars can hardly be surpassed in the East for diversity and picturesqueness. The superb mosque of Masjid-i-Shah, erected by Shah Abbas on the Meidan (the great square in the centre of the city) still remains unique in the glory of its green and blue tiled dome and minarets, but the Zill-es-Sultan, the ancient palace of the Sefavi princes, has been marred by clumsy attempts of restoration. The monumental bridge, Ali Verdi Khan, famous for its pillaried galleries, is the most magnificent of the five great bridges which span the broad and shallow bed of the Zeudeh Rud. To-day the population is about 250,000, whereas two and a half centuries ago, Chardin, the great French traveller, estimated the population at about 1,000,000.

After Teheran, the country began to improve; our route lay through the province Azerbayan, where the rich soil and good rainfall supports a denser population than elsewhere in Persia. The inhabitants of Azerbayan speak Turkish, the province having been under Turkish rule for several centuries. We stayed a few days at Tabriz, laid in a stock of provisions, as we were warned of the food shortage in Russia, and changed our Persian money into American dollars. These are taken readily everywhere in Russia. Tabriz was at one time one of the main entrepots of trade in the East. The great overland route from Europe to the Far East commenced at Trebizond, on the Black Sea, passed through Erzeroum, in Armenia, and continued through Tabriz to Meshed and Bokhara. We continued our journey to Persian Julfa, and there said good-bye to Persia, crossed the iron bridge over the Araxes River which forms the boundary of N.W. Persia and Asiatic Russia, and found ourselves in Russian Julfa, a small town in Nakhitchevan, one of the many autonomous republics that make up the U.S.S.R.

This part of Russia is geographically termed Transcaucasia, a convenient general name for the countries lying between the Black Sea, the Caspian and the Caucasus. The Caucasus roughly speaking is a chain of snowy mountains, the highest of which is Kazbek, 15,000 feet high, running from the Black Sea to the Caspian Sea. It divides Europe from Asia. The Anti-Caucasus is a chain of mountains lying south of the Caucasus. The Plain country, traversed by the Kuru, on which Tiflis, the capital, lies, between the Caucasus and the Anti-Caucasus, is about 40 miles wide and very fertile wherever the rainfall is good, i.e., the western end. The eastern end, near Baku, is arid; the rainfall is about 12 inches. The Caucasus is divided up into many small autonomous republics, containing different races and speaking different languages. There are the Georgians, Christians of the Georgian order, living in the central part of the

Caucasus, with Tiflis as the capital. They speak Armenian, and are Armenian Orthodox Christians.

Going down the Kur from Tiflis towards the Caspian, one finds the Tartars, a branch of the great Turkic family. Their country is called Azerbayan, not to be confused with the Persian Azerbayan. They are Muhammadans, speak Turkish, and Baku is the capital. West of Georgia lies Imeritia, and, further west, along the eastern coast of the Black Sea, lies Mingrelia, with Batum as its chief city. That portion of the Caucasus is low-lying and humid, and cotton and tea are grown. The climate is enervating; the rainfall is 63 inches. Armenia stands at a great height above sea-level, and is bleak, the winters are long and terrible, and snow lies till the middle of April. The mean winter temperature is 16° F.

Probably nowhere else in the world can so great a variety of stocks, languages and religions be found huddled together in so narrow an area as in the Caucasian chain. Every nation that passed from north to south left some specimens of its people behind to found a kind of ethnological museum. The population of the Transcaucasian Federated Socialist Soviet Republic, to give it its official name, is 5,810,000.

BOOK REVIEWS.

Australia and New Zealand. L. S. Suggate. G. Harrap and Co., 1931. 440 pp. Price 10/-.

This book is one of the few which has been written about Australia and New Zealand. While it represents a useful compilation of material on the geography of these regions, the author has little first hand knowledge of them. The chief feature of the book is the amount of statistical data which it contains. Statistics form a concrete basis for the greater part of the book, devoted to the economic geography of Australia. Unfortunately there are some noteworthy errors. For instance, Katoomba is described as the centre of a flourishing pastoral and fruit-growing region. The rapid development of this town has, however, resulted from a flourishing tourist industry for which the scenery is responsible. There is a notable absence of any pastoral or agricultural development, and the only settlement in this part is in tourist centres which are found at intervals along the ridges. The author, moreover, refers to the Blue Mountains as a belt of limestone, whereas the rock outcrop in this part is of Hawkesbury sandstone.

The writer states that the Western Slopes of New South Wales contain more people than do the Tablelands, but the reverse is so. Also the density of population on the Tablelands is greater than on the Western Slopes. The north coast railway line in New South Wales is said to go through Port Macquarie, but the nearest railway town to this port is Wauchope, some ten miles distant.

In dealing with the geography of Australia, the general physical geography, exploration, settlement and development, and the economic geography are first considered and then each of the political divisions is dealt with. This conventional method of treatment, instead of an entirely regional account means that a considerable amount of repetition is necessary.

The book contains many sketch maps in addition to a number of production tables and a short statistical summary of areas, populations, imports and exports for the various States and Territories. A large number of good photographs form an interesting part of this book.

C.D.J.B.

A History of Geographical Discovery and Exploration. J. N. L. Baker. G. Harrap and Co., 1931. 544 pp., + 50 maps.

This book should fill a variety of needs. It supplies a summary of geographical discovery from the time of the early Greeks to 1930 A.D., with notable breadth of view and a certain balance of proportion in the midst of great detail. The method employed, as indicated in the title, is that of the historian rather than the geographer, and the text is something of a chronicle of the voyages and journeys that have built up our knowledge of the world. The book is illustrated with fifty outline maps showing routes of explorers and is well bound and printed, with an excellent index.

The main fault the geographer will find with the book is the predominantly historical outlook. The enormous ground covered and the space available may be acceptable excuses, but there is still need for a truly geographical study of exploration and discovery of the continents.

(Our copy from the publishers.) J.A.

Lasseter's Last Ride. Ion L. Idriess. 5th Edition. Angus and Robertson, 1932. 65 illustrations.

Flynn of the Inland. Ion L. Idriess. 2nd Edition. Angus and Robertson, Sydney, 1932. 306 pp., 58 illustrations.

These two books are welcome additions to the growing list of books dealing with first-hand descriptions of Australian rural environments. Books such as these and the novels of K. S. Pritchard, Louis Kaye, Brent of Bin Bin, and others, are valuable from the geographer's viewpoint because of their insight and deep understanding of the characters of various regions of the continent.

Both books deal with the Interior. The first is the story of Lasseter's quest for a gold-reef once found and then lost because of faulty mapping. Lasseter and his companions, who included two aeroplane crews, pursued this search in the very dry country on the West Australian borders to the west of Alice Springs. Despite excellent equipment, including an aeroplane (later replaced by a second) and a motor truck, the party was unable to reach its objective, and Lasseter, on a lone attempt perished among wild blacks.

The second is the story of the development of the Australian Inland Mission and its organisation of nursing homes and the aerial medical service, much of the inspiration being due to the Rev. John Flynn. One might say that where Lasseter was concerned with the wildnerness, Flynn was interested in the settled portions of the interior, but there are many points in common in the two books. They succeed admirably in conveying the atmosphere of the vast interior and the written matter is illustrated by the inclusion of many new and unusual photographs. It would be hard to find a more attractive way of studying the semi-arid grazing lands and the deserts of the centre of the continent than by reading the descriptions of scenery, mode of life, problems and possibilities, native ways and customs contained in these books.

(Our copies from the publishers.) J.A.

Geographical Society of N.S.W.

SCIENCE HOUSE, GLOUCESTER & ESSEX STREETS, SYDNEY.

REPORT OF THE COUNCIL FOR THE YEAR ENDED 30th JUNE, 1931.

The Council have much pleasure in presenting their Fourth Annual Report.

Membership.—The total membership at 30th June was 264. During the year 25 new members were elected.

Meetings of Council.—Throughout the year 10 meetings of the Council were held. The attendance of Members of Council at these meetings was as follows:—

Prof. Macdonald Holmes (President)	10
Prof. W. R. Browne (Vice-President)	5
Mr. David G. Stead (Vice-President)	6
Miss D. R. Taylor (Vice-President) (resigned May, 1931)	2
Dr. C. Anderson (Vice-President)	8
Mr. M. F. Albert (Hon. Treasurer)	3
Capt. F. Bayldon (Councillor)	8
Dr. Marie Bentivoglio (Councillor)	4
Prof. L. A. Cotton (Councillor)	0
Mr. D. C. Ferguson (Councillor)	7
Mr. R. G. Gosset (Councillor)	10
Mr. H. Hamilton (Councillor)	5
Miss E. Legg. (Councillor)	5
Mr. H. B. Mathews (Councillor)	2
Comm. M. H. Moyes (Councillor)	9
Mr. A. L. Nairn (Councillor)	9
Miss E. Slack (Councillor)	6
Mr. E. P. Taylor (Councillor) (resigned May, 1931)	2

Council.—During the year several changes took place in the composition of the Council.

Dr. Marie Bentivoglio resigned the position of Acting Hon. Secretary, and in August Mr. Daniell was appointed Hon. Secretary and Mr. J. Andrews, Assistant Hon. Secretary. Dr. Bentivoglio was elected a Councillor in place of Mr. Daniell. In April, Mr. Albert returned to the Council after his absence abroad, and resumed his position of Hon. Treasurer.

Lectures.—The usual monthly meetings were always well-attended. The lectures were given in the rooms of the Royal Empire Society or in the Department of Geography at the University. The lectures were, in most cases, illustrated by lantern slides or films, and received on several occasions considerable attention from the Press.

The Council are anxious that, at the monthly meetings, Members will avail themselves of the opportunity for comment, discussion or reminiscences. This year there has been a fair response, and it is hoped that this progress will be maintained.

The following lectures were delivered throughout the year:—

July 8, 1930.—Prof. W. R. Browne: Some Geological Factors in Australian Settlement and Industry.* (Presidential Address.)

August 12, 1930.—Dr. Chas. Anderson: The Orkney Islands.

September 9, 1930.—Prof. Macdonald Holmes: Egypt, the Suez and the Sudan*.

October 14, 1930.—Dr. Rudolf Kuraz: Czechoslovakia.

November 11, 1930.—Mr. P. G. Gilder: The Far West of New South Wales.

---

* Published in the Society's journal, "The Australian Geographer."

November 20, 1930.—Mr. B. J. Palmer: China and Japan.
February 10, 1931.—Mr. E. W. Chinnery: Administrative Exploration in New Guinea.
March 10, 1931.—Dr. Raymond Firth: The Eastern Solomons.
April 14, 1931.—Capt. E. A. Fisk: India and Her People.
May 12, 1931.—Mr. P. E. Teppema: The Dutch East Indies.
June 9, 1931.—Comm. Morton H. Moyes: Antarctic and Sub-Antarctic Lands.

Journal.—The third issue of the Journal appeared at the end of the financial year, and was a magazine of 73 pages. This contained a number of papers on subjects of general and scientific interest, and was well received by the Press and public.

Donations.—The Council have pleasure in recording the gift of a number of maps and an atlas of the colonies of the German Empire, by Mr. Lingford, of the Royal Empire Society.

Presidential Address.—At the Annual Meeting, held on July 8, 1930, Prof. W. R. Browne delivered the Presidential Address, taking as his subject: "Some Geological Factors in Australian Settlement and Industry."

Excursion.—On Saturday, December 13, 1930, the Society held an excursion to Stanwell Park, which was attended by a small but enthusiastic party, despite a number of counter-attractions in the city. It is hoped that, in future, it will be possible to hold such excursions during the year so that members will have opportunities for meeting one another that are not possible at the monthly meetings.

Library.—The Society's Library has continued to grow by the accumulation of journals exchanged with other similar bodies. Among others, journals were received from the following:—

Royal Scottish Geographical Society.
Royal Empire Society.
American Geographical Review.
Societe de Geographie—Paris.
L'Association de Geographes Francais.
R. Societe Geographica Italiana.
Real Sociedad Geographica—Madrid.
Societe de Geographie de Geneve.
Sociedad Cientifica "Antonio Alzete"—Mexico.
Societe de Geographie Commerciale de Bordeaux.
Liverpool Geographical Society.
Library of the Museo Nacional—Republic of Colombia.
American Museum of Natural History.
Netherlands Indies Science Council.
Geographischen Gesellschaft in Wien.
Association of American Geographers.
Clark University, Mass. (Economic Geography.)

General.—The Council wishes to take this opportunity of thanking the Members for their support during the past year. For the coming year the Council has under consideration several proposals for enlarging the activities of the Society, one of them being the establishment of a Research Circle, for the discussion of special subjects by groups of Members who are interested; for the promoting of special investigations and for the criticism of the results obtained. It is hoped that efforts can be undertaken to promote the more frequent publication of the Society's Journal, so that workers throughout the State will have opportunities for making their work known, so contributing to our knowledge of Australia.

On behalf of the Council—

J. MACDONALD HOLMES,
President.

FREDERICK DANIELL }
JOHN ANDREWS } Hon. Secretaries.

Geographical Society of N.S.W.

INCOME AND EXPENDITURE ACCOUNT FOR YEAR ENDED 30th JUNE, 1931.

EXPENDITURE.	£	s	d	INCOME.	£	s	d
To Printing Geographer Vol. 1, Part 3.	30	0	0	By Subscriptions	106	17	6
„ Hire Hall	19	8	6	„ Advertising in Geographer	3	3	0
„ Postages	20	10	10	„ Geographer Sales	2	19	0
„ Printing and Stationery ..	1	12	4				
„ Sundries		10	6				
„ Excess Income over Expenditure	40	17	4				
	£112	19	6		£112	19	6

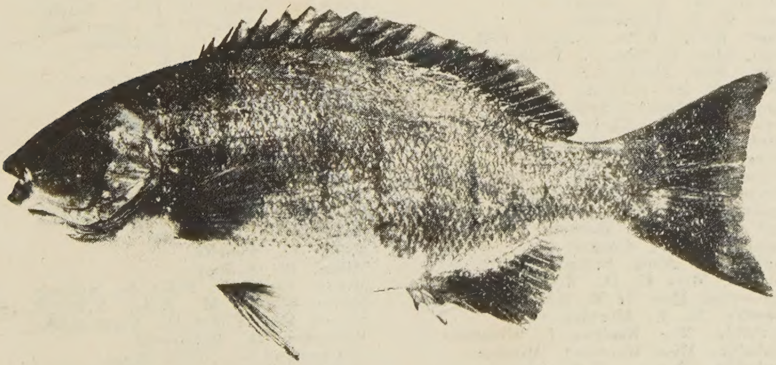
BALANCE SHEET AS AT 30th JUNE, 1931.

LIABILITIES.	£	s	d	£	s	d	ASSETS.	£	s	d
Accumulated Funds at June 30, 1930 ..	7	14	9				Cash at Bank and On Hand ..	18	6	7
Add Excess Income over Expenditure .	40	17	4				Sundry Debtors	5	3	0
				48	12	1	Subscriptions Outstanding	48	2	6
Subscriptions Paid in Advance				23	0	0				
				£71	12	1		£71	12	1

M. F. ALBERT,
Hon. Treasurer.

I hereby certify that I have examined the Books and Vouchers of the Society, and that the above is a true and accurate Statement of the Society's affairs as shown by the Books.

E. G. TROUTON,
Hon. Auditor.



BLACKFISH: Very common in estuarine waters. Fine rod fish. Known variously as Black Perch, Ludrick and Rock Perch in Victoria; Black Bream, Black Perch and sometimes Sweep in Tasmania.

GEOGRAPHICAL SOCIETY OF NEW SOUTH WALES.

LIST OF MEMBERS.

Abbotsmith, F. A., Narrabri.
Adams, Miss Moyna, Woollahra.
Albert, M. F., F.R.G.S., Sydney.
Allen, Major A. M., M.C., Sydney.
Anderson, Dr. C., M.A., Sydney.
Andrews, J., B.A., Artarmon.
Ashton, Colin M., Sydney.
Back, Miss A., Petersham.
Back, Miss K., B.Sc., Petersham.
Bailey, Mrs. Molly, Roseville.
Baldwin, Miss N. J., Waverley.
Bayldon, Capt. F. J., F.R.G.S., Sydney.
Beale, Miss Joan, Strathfield.
Bentley, A. M., Leichhardt.
Bentivoglio, Dr. Marie, The University.
Bishop, E. J. H., Armidale.
Bishop, J. E., Sydney.
Black, Rex C., Auburn.
Blick, C. I. W., Petersham.
Bowler, L. H., Sydney.
Brewster, Miss Agnes, B.A., Ashfield.
Broadley, Herbert, Newtown.
Brodie, Francis T., Petersham.
Brown, H. L., Sydney.
Brown, Miss Ida, B.Sc., The University.
Browne, Prof. W. R., D.Sc., The University
Brownhill, D. J., Sydney.
Bryce, E., F.R.G.S., Sydney.
Burnet, J. H., Longueville.
Burrell, Miss D., Wentworthville.
Burrell, Miss L. H., Wentworthville.
Butson, Miss Jean E., Mosman.
Byrne, Miss Sheila, Bondi Beach.
Campbell, Miss M., Randwick.
Carrington, L. C., Manly.
Carroll, G., Edgecliffe.
Castleman, A. W., Petersham.
Challands, G. L., Rose Bay.
Cheetham, Miss M. E., Rockdale.
Cheetham, Miss Mabel E., Rockdale.
Chisholm Ross, Dr., Sydney.
Clark, C. T., Warrawee.
Clark, W. E., Annandale.
Clifton, Miss Maude, Homebush.
Cohen, F. L., Rabbi, Potts Point.
Conacher, C. W. D., Sydney.
Connelly, Miss I. G., Ashfield.
Cotton, Miss E. A., Hornsby.
Cotton, Prof. L. A., University.
Cousins, W. G., Sydney.
Craft, F. A., University.
Crago, E. A., B.Sc., Dulwich Hill.
Craig, Mrs. E. Warren, Wollongong.
Culey, Miss Alma, B.Sc.
Dallen, R. A., F.I.I.A., F.C.I.S., Sydney.
Daniell, Frederick, Sydney.
Dee, T. W. H., Canberra.
Denison, Sir Hugh, Sydney.
Deves, Miss T. F. L., B.Sc., Five Dock.
Dickson, E. A., Oatley.
Dixson, Dr. T. Storie, Sydney.
Dixson, W., F.R.G.S., Sydney.
Doak, Miss J. K., Mosman.
Douglas, M. V., Coogee.
Doull, Miss Alma, Stanmore.
Dowsett, Miss E. D., Roseville.
Drummond, Miss H. R., B.Sc., Neutral Bay.
Dumphy, M. J., Mortdale.
Dunbabin, Mrs. Beatrice I., Mosman.
Dunbabin, Miss Margaret, Mosman.
Dunbabin, Thomas, M.A., Mosman.
Eames, Miss E., Longueville.
Eastwood, Miss Lilian, Woy Woy.
Emanuel, Miss Una R., Roseville.
Enright, W. J., West Maitland.
Eve, H. D., Canberra.
Ferguson, D. C., Sydney.
Finniss, L. H., Doon, Vic.
Fitzpatrick, George, Sydney.
Flynn, Miss M. C., Wahroonga.
Gamble, Mrs. M. J., Chatswood.
Garcia, Comm. R. C., Sydney.
Geer, Miss W. D., Forest Lodge.
Gentle, Miss L., Lane Cove.
Gilmour, Miss Lorna, The University.
Godden, Miss Ruth, B.Sc., Leeton.
Gorrell, Spencer, Woollahra.
Gosset, R. G. W., Longueville.
Gow, Miss Hilda, Centennial Park.
Graham, Miss M. L., Burwood.
Graham, Miss Violet, Burwood.
Grout-Smith, C. T., B.Sc., Hurstville.
Halligan, G. H., F.G.S., Killara.
Hamilton, H. W., B.Sc., The University.
Hemingway, Miss Mildred, Glebe Point.
Henriques, Mrs., Cremorne.
Henriques, Miss J. M., Cremorne.
Heron, Mrs. Emily, Cremorne.
Hewins, Mrs. L. I., Potts Point.
Hindmarsh, P., The University.
Hinks, L., Sydney.
Holmes, Prof. J. Macdonald, B.Sc., F.R.G.S., The University.
Hope-Marchant, Miss D., Ashfield.
Hudson, E. T., Sydney.
Hunt, K. R., Longueville.
Imrie, Miss C. A., Northwood.
Jackson, C. F., F.R.G.S., Marrickville
Johnson, Miss J., Homebush.
Joplin, Miss G. H., B.Sc., Eastwood.
King, H. W., B.A., Woy Woy.
King, Sir Kelso, Sydney.
King, James McEwan, The University.
Kirwan, W. T., Sydney.
Knight, Miss H. R., West Ryde.
Krippner, R., Stanmore.
Langford, R. G., Bathurst.
Larcombe, E. E., Concord West.
Lawry, Miss D. M., Cremorne.
Lawson, Miss M. M., Kandos, N.S.W.
Lee, Mrs. R. S., Morpeth.
Legg, Miss E., B.Sc., Rockdale.
Levis, R., Longueville.
Ley, Mrs. David, Neutral Bay.
Ling, Miss M., Haberfield.
Livingstone, Miss Anne, Mittagong.
Lowndes, Arthur G., B.Sc., Balmain.
Macdonald, Miss H. S., Strathfield.
Macey, Miss R. C., Strathfield.
MacInnes, A. R., B.A.
Mackaness, G., M.A., University.
Mackay, D. G., Port Hacking.
Mackenzie, B. D. M., Sydney.
Mackenzie, H. M., Sydney.
Mackinnon, Miss Jean, Cammeray.
Mackley, Miss Audrey, North Sydney.
Mathews, H. B., B.A., Sydney.
Matthews, Miss Gladys, Cremorne.
Matthews, Miss Ruby L., Cremorne
Maze, W. H., Burwood.
Miller, C., Penrith.
Millin, B., Sydney.
Moore, Fred. H., F.R.G.S., Sydney.
Moyes, Comm. M., B.Sc., F.R.G.S., Syd
Moyes, Miss Violet D., Northwood.
McCarthy, D., Balgownie
McCausland, C., Glebe Point.
McGarry, Miss K. P., B.A., Hunter's Hill.
McLean, Miss G., Croydon.
McLuckie, Dr. John, The University.
McMaster, F. D., Cassilis, N.S.W.
Nairn, A. L., M.A., F.R.G.S., Longueville.
Naylor, G. F. K., M.Sc., Ingleburn, N.S.W.
Nicholl, Dr. Harvey, Barham, via Mudgee.

Noble, A. G., Sydney.
O'Connor, D. P., Waverley.
Oliver, Miss E. H., Marrickville.
Parnell, Miss Margaret, Campsie.
Pearse, Capt. A. W., F.R.G.S., Sydney.
Pendelbury, Miss Mavis, Crows Nest.
Piggott, O. A., Vaucluse.
Pont, Miss M. W., Bondi.
de Possel, Mrs. H., Cremorne.
Potts, Mrs. C. V., Vaucluse.
Potts, C. V., Sydney.
Powell, Miss D. K., B.Sc., Strathfield.
Powell, John, Cremorne.
Price, H. J., Forest Lodge.
Pulsford, S., Epping.
Pye, Elmo, Harris Park.
Rathbone, John C., Bondi North.
Rickard, Sir Arthur, Sydney.
Rickard, L. G., Naremburn.
Ritchie, A. A., Sydney.
Robinson, H. E. C., Sydney.
Roche, Miss M. H., Mosman.
Rowe, J. B., Glebe Point.
Sargeant, F. A., Drummoyne.
Sargeant, Miss R. A. I., Drummoyne.
Simpson. E. J., Terrikiba, N.S.W.
Slack, Miss Ella M., North Sydney.
Smerdon, G., Milman, Sydney.
Smith, H. R., Newtown.
Smythe, F. T., Longueville. .
Soady, T. A., Sydney.
Somerset, A., Sydney.
Soul, Miss J. E., Sydney.
Spencer, Ian, Maroubra.
Spier, William, Sydney.
Stanley, G. A. V., B.Sc.
Stanley, Miss H. V., B.A.
Stead, David G., Watson's Bay.
Steinbeck, W. M., Granville.
Stephen, Miss Doris, B.Sc., Roseville.
Stevenson, Capt. A., Elizabeth Bay.
Stewart, R. V., B.Sc., Chatswood.
Stinson, Miss Jessie, Auburn.
Stuart, Miss M. R., Roseville.
Sully Walter, Vaucluse.
Sussmilch, C. A., Darlinghurst.
Swan, L. A., Strathfield.
Tabberer, Mrs. A. B., Balmoral.
Taylor, Mrs. C. D., Artarmon.
Thatcher, Rev. Dr. G. W., Glebe.
Thomas, David S., Strathfield.
Thomas, J. F., Tenterfield.
Thompson, Miss Ena M., Mascot.
Thornley, William H., Roseville.
Thorpe, W. W., Sydney.
Tindall, Miss A. M., St. Peters.
Trouton, E. Gard, Elizabeth Bay.
Turner, R. A. B., F.R.A.I., Mosman.
Waghorn, Miss B. E., Paterson.
Waller, Miss Marian, Stanmore.
Wallis, Miss G., Waverton.
Walker, Miss K., North Sydney.
Walter, E. Lee, F.R.G.S., Sydney.
Waterhouse, L. L., The University.
Watts, Mrs. C. E., Artarmon.
Whalen, G., Gladesville.
White, E. R., Randwick.
Whitham, Miss A. R., The University.
Whitham, Miss B. A. B., The University.
Whitham, Miss Nancy, The University.
Whittell, Henry R., Pennant Hills.
Wiesener, Miss Betty, Strathfield.
Willshire, Miss J., Mosman.
Wilshire, Miss Olga, B.A., Cremorne.
Wilson, Miss C. G., Killara.
Wilson, J. F., Balmain.
Wilson, L. G., Sydney.
Wylie, D. S., Sydney.

"EVERY BIRD OF AUSTRALIA IN COLOUR"

WHAT BIRD IS THAT?

A GUIDE TO THE BIRDS OF AUSTRALIA. ILLUSTRATED IN NATURAL COLOURS.

By NEVILLE CAYLEY, F.R.Z.S., member of the Royal Australasian Ornithologists' Union. With a Preface by G. R. Thomas, Director of Education, N.S.W., President of the Gould League of Bird Lovers, N.S.W. 338 pages, illustrated with thirty-six plates in colours (each 8 x 5¾ inches), eight plates in black and white, reproducing photographs of typical habitats, and a locality map. 12/6 (Post 5d).

Sydney Mail:—"No more remarkable book of its kind—remarkable alike for its clarity, its comprehensiveness, its interest, and its beauty—has ever been produced in Australia."

Australian Zoologist:—"Very nearly the ideal handbook for Australian bird observers. The illustrations are life-like. . . . The colour printing has reached the high-water mark of perfection in brilliancy and accuracy of register. That Mr. Cayley fully acknowledges his indebtedness to several ornithologists and bird observers for assistance in preparing the letterpress does not in any way lessen the debt we all owe him for the wonderful book he has given to the bird lovers of Australia."

The Argus (Melbourne):—"Mr. Neville Cayley has done a fine thing for ornithology in using a question as a title for a new bird book, and for supplying the complete answer. His book stands out in the perfection of the brushwork. With a copy of the book and a pair of field glasses, the day of guesswork in the Australian birdland ends."

Brisbane Courier:—"It is a classic in the bird world."

North Otago Times (N.Z.):—"The publication is on a plane with the rare and much-valued work of Buller on the birds of New Zealand. . . . The work is certainly an eye-opener."

West Australian:—"The value of this book cannot be assessed in £.s.d. It will be a source of inspiration to bird lovers in every State in Australia."

A. H. Chisholm, author of "Birds and Green Places," in the **Sunday Sun:**—"Here is a book that would have gladdened me exceedingly in early days among the birds. . . . Every bird of Australia in Colour, with brief notes added, and all for 12/6. I cannot imagine any youngster in the land shutting his eyes to such a bargain."

The Age (Melbourne):—"No aspect of bird study is overlooked in Mr. Cayley's volume; clothes to wear in the bush, the kind of entries to make in the note-book, and the need of a mirror tilted and fixed to the end of a long stick. Nothing is forgotten."

OBTAINABLE AT ALL BOOKSELLERS.

Building Publishing Co., Ltd., 20 Loftus St., Sydney.